

Dancing Art

Banners with all the right moves

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"Physics is a blind alley again. In any case, it has become too difficult for me, and I would prefer to be a comedian, or something like that, and hear no more about physics."
— Wolfgang Pauli, scientist

Anatomy 101 was the most difficult course I took in college. In fact, it was so difficult, I had to withdraw from the class or risk receiving a failing grade. When I spoke with the professor who taught the course, he was stunned by my inability to comprehend the subject matter.

"It's only physics," he quipped. "What's so hard about physics?" Luckily, he didn't expect a response and agreeably signed the paperwork that would release me from his class.

My fear of physics resurfaced during a recent conversation with David Durlach, founder and director of TechnoFrolics (www.technofrolics.com), about the technology behind his company's Dancing Banners™. When he said, "It all has to do with physics," I groaned. Sensing my discomfort with a subject that, according to Durlach, "many people have trouble with," he explained his company's banner technology carefully and cited helpful examples whenever possible.

Founded in 1988, TechnoFrolics (Somerville, MA) grew out of



Computer-controlled, brushless servomotors and magnetic particle brakes highlight the technology behind TechnoFrolics' (Somerville, MA) Dancing Banners™. Intended for big-budget clients, the high-end banners typically measure 2 to 3 ft. wide and 10 to 25 ft. tall.

Durlach's love for technology, and fascination with artistic expression, human emotion and relationships. He was convinced the synergies of technology, emotion, science and art could result in numerous exciting and enriching applications.

To date, the company's "dancing artworks" have been exhibited throughout the United States, Switzerland, Japan, Mexico and Canada in such diverse contexts as art galleries, tradeshow, science museums, interior-design shows and technology conferences. In addition to its Dancing Banners, TechnoFrolics offers interactive video presentations; 3-D moving landscapes composed of fine, mag-

netic particles; and experimentation and exploration stations for interactive science-museum exhibits.

Learning to dance

In 1998, the company built its first, early-stage prototype of the Dancing Banners as part of a National Science Foundation (NSF) Small Business Innovation Research grant. TechnoFrolics designed the banners to capture the wave motion of its physics-artwork creation, Tower-Of-Triangles. Durlach likened the project to taking a Slinky® spring toy, enlarging it by a factor of 10, and then adding sophisticated, electronic-motion control.

He explained, "Think about



Some FAQs

Q: What kind of Dancing Banners choreography is possible?

A: Live dances set to music; organized movements synchronized with a spoken narrative; gentle, silent transformations — all which can be programmed to occur at any time of the day or week, or initiated by passersby.

Q: Can the Dancing Banners be made even more interactive?

A: Yes. Via rugged, stainless-steel, dial-user interfaces, the public can directly control them. Also, they can be “played” like a visual equivalent of a musical instrument by a professional performer — similar to how moving lights are played.

Q: Can the Dancing Banners be installed horizontally (as opposed to vertically)?

A: For short lengths, yes; for long lengths, no. This isn't the recommended orientation.

Q: Can the Dancing Banners be non-rectangular?

A: Yes, within limits. A banner part near a ceiling-fixture point must have sufficient width and strength to support the rest of the banner's weight. For example, an hour-glass shape would work. However, a triangle suspended by its point wouldn't.

attaching a Slinky to a computer-controlled wiggler, so to speak, that would wiggle the Slinky — in a twisty way — at different rates, to achieve really fun wave patterns. The primary purpose of the Tower-Of-Triangles was to serve as a medium through which you could view different wave patterns.”

In 2001, for the first time, TechnoFrolics commercially displayed its Dancing Banners at Las Vegas' Venetian hotel for the GIGA Information Group conference. At approximately the same time, the company sold a three-banner system to a client in Cyprus.

Choreographed, computer-controlled, moving-sign and kinetic artwork, the Dancing Banners are designed primarily for clients seeking show-stopping performances and who can afford their approximate \$60,000 to \$100,000 price tag (for a group of six banners).

Available for rent or purchase, customized or non-customized (note that rental costs for non-customized versions begin at roughly \$5,000, plus shipping and installa-

tion), the banners are typically used for one-time/short-term events, but can also be displayed permanently.

To date, TechnoFrolics has installed its banner systems both indoors and outdoors. For protection against the elements, the company recommends installing its outdoor systems within an acrylic weatherproof enclosure. If a client requires a semi-permanent/permanent outdoor display to be unprotected and exposed, the banner's control electronics must at least be weatherproofed. Plus, for sufficient protection against high winds, the banners would require internal steel cables. According to the company, creating an outdoor installation for year-round usage could increase a banner system's cost by 50%.

How it all works

The Dancing Banners' electronics incorporate computer-controlled, brushless servomotors and magnetic particle brakes designed for the aerospace and factory-automa-

tion industries. These same components are used in assembly robots often seen on television and in movies — the motors that make the robotic arms move at high speeds, and stop on a dime during semiconductor or automotive assembly.

The banners' servomotors allow high-speed accelerations and decelerations, and accurate positioning. Further, they can be programmed to go from a complete stop to a high-speed blur virtually instantaneously; reverse direction and rotate 100 times; wiggle back and forth at high frequencies; and then come to an abrupt stop facing due east.

Computer-controlled friction brakes control the banners' static and slow-moving dramatic twists. The manufacturer notes that, if banners are at least 20 ft. long, clients can opt to omit friction brakes. However, if friction brakes



are omitted from banners with shorter lengths, the banners won't achieve their full range of visually engaging twists.

Furthermore, a Digital Multiplex (DMX) high-speed, communications standard — typically employed by the theater and corporate-event industries to control moving lights — controls the entire banner system. TechnoFrolics didn't develop the DMX standard, but the company did develop a way for its banners to respond appropriately to DMX codes.

"A light," Durlach explained, "might have a DMX command to change lens color, or pan left or right. We developed a banner language to respond to such DMX commands, so our banners, for example, might follow a command to shimmer or twist."

Because the banners must withstand twisting and untwisting, they're made from Lycra®/Spandex, which easily expands and

contracts. In addition, the banners' specially designed, stitched-in, lattice backbone allows them to survive high-torque twists and high-speed motions. The lattice comprises dozens of parallel members, similar to sail battens, with custom swivel fittings at each end.

To achieve the greatest visual effect, the Dancing Banners are typically 2 to 3 ft. wide and 10 to 25 ft. tall. Although Durlach recommended they not be less than 10 ft. tall — because they begin to lose their grace and fluidity of motion — he noted the banners can exceed 25 ft. tall. Further, although a banner can be made taller without adjusting its motor's size, a banner can't be made wider without making its motor more powerful to preserve the soft sign's dramatic twists and high-speed movements.

Custom banner decorations are typically dye-sublimated, because, from TechnoFrolics' experience, this printing process works better

than conventional embroidery and/or screenprinting methods, for example, which could fray and peel during the banners' expansion and contraction. For clients uninterested in having an entire banner printed, TechnoFrolics offers Lycra/Spandex banner sleeves that customers can install and remove as needed, as well as have custom-printed quite inexpensively.

An affordable alternative

Realizing its Dancing Banner technology is too high-end for some potential clients, TechnoFrolics has created an alternative solution for businesses seeking unique, moving backdrops without computer-controlled components.

The company's Twirling Banners™ comprise motors, but no computer-controlled aspects, making them less expensive, simpler to operate and easier to install. According to Durlach, the Twirling Banners are designed for clients seeking cost-effective, uniformly moving (not dancing) elements of color and text/imagery.

Because the banners don't require complex, technical setup, clients can adjust the banners' twisting and rotation speed — slow, medium or fast — as well as control whether they spin clockwise or counterclockwise. Plus, customers can perform graphics changeovers quickly and easily.

Like the Dancing Banners, Twirling Banners can be purchased or rented for indoor or outdoor use. However, weatherproofed versions cost significantly more. Twirling Banners rental costs start at \$350/banner, and purchase costs are approximately \$2,000/banner.

Durlach concluded that, "The Dancing Banners are designed for big-budget clients seeking high-end attractions that will *wow* audiences and lure media attention. Conversely, the Twirling Banners are for more limited-budget clients seeking elegant, moving displays that will catch passersby attention." ■