



Contents

---

Special Events

---

Newsletter

---

TR on the air

JOHN BENDITT ON EMERGING TECHNOLOGIES

My Tools

2 free trial issues

**Fluorescent LANs Light the Way**  
By Alan Leo

June 6, 2001

*Data hidden in the flicker of fluorescent bulbs may help the disabled lead independent lives.*

The flicker of fluorescent lights, long a symbol of institutional drear, may give new freedom to the handicapped, thanks to a high-tech startup that sees the bulbs as the perfect transmitters.



Steven Leeb's invention could aid the disabled by transmitting data through fluorescent lights. (Photo courtesy of Steven Leeb)

Talking Lights, a Cambridge-based MIT spinoff, is developing a local area network that uses fluctuations in fluorescent lights to transmit data. Inventor, company founder and MIT professor Steven Leeb predicts the technology will be a boon for the disabled.

For example, he says, airport lights could direct a blind person carrying a special receiver worn as a badge or held like a PDA to the correct gate. Auditorium lights could broadcast enhanced audio to the hearing disabled, or transcriptions to the deaf. And research published this month suggests that the technology could greatly improve the rehabilitation of persons with traumatic brain injury.

**Hallelujah**

In his MIT laboratory, Leeb recently demonstrated his invention. First, he turned on a circular fluorescent light. "See?" he asked. "A normal lamp. You probably have one in your bathroom."

Next, he picked up his receiver—a black box attached to two small speakers. From a few feet away, he pointed the receiver at the lamp. Music blared from the speakers. Tinny, but clear, came the familiar chorus from Handel's *Messiah*.

At the heart of the device is a new kind of ballast, the component of fluorescent lights that regulates the amount of electricity flowing into the lamp. Magnetic ballasts dim the lamp about every 1/120<sup>th</sup> of a second—the normal oscillation of alternating current—causing an imperceptible flicker. Newer electronic ballasts speed up the flicker rate to milliseconds, eliminating eyestrain and hum, two complaints long associated with fluorescents.

Since electronic ballasts flicker independently of the current's oscillation, Leeb realized that they could, with some modification, encode data. He designed ballasts that transmit both digital data—by turning the light on and off in short bursts—and analog data, by modulating the light's brightness by degrees.

A basic Leeb-designed ballast can encode a simple repeating signal, such as the location of an emergency exit. A more advanced version includes a modem to read data transmitted over the power line.

Fluorescent transmitters offer two advantages over radio systems like Bluetooth, says Talking Lights CEO Neil Lupton. The first, he says, is price: a building can

your opinion is important to us

take our survey

retrofit the company's ballasts to existing fixtures for "incrementally more" than high efficiency electronic ballasts (which cost between \$15 and \$25 retail). Second, unlike Bluetooth's current design, fluorescent transmitters can be geographically isolated, transmitting location information for different parts of the same room.

### Gentle Reminder

Once Leeb figured out how to transmit information via fluorescent lights, he racked his brain for applications. Realizing its potential as an assistive technology, he contacted Harvard Medical School.

David Burke, director of the brain injury unit at Spaulding Rehabilitation Hospital in Boston, responded. Each year, Burke says, as many as two million Americans suffer traumatic brain injury—mostly from car accidents, falls and violence. Although physically capable of caring for themselves, people with severe brain injuries often lack the cognitive and memory skills to manage their daily lives. Many require constant monitoring—a labor-intensive solution costly in terms of both money and the patient's independence.

Burke and Leeb designed a system to remind brain-injured patients at Spaulding about their schedule. Each participating patient carried a "Personal Locator and Minder," a modified PDA programmed with the patient's schedule. Lights in the patients' rooms, hallways and certain other areas were set up to broadcast location information to the Personal Locator.

When the time of a scheduled event, such as therapy or medication, drew near, the Personal Locator would remind the patient. Using location information from the lights, the Personal Locator would judge whether the patient was proceeding toward the event and give more detailed directions if needed.

The results of the study are published in June's *Journal of Head Trauma Rehabilitation*. Patients got to their destinations earlier and with less human prompting. There was a significant reduction in the need for staff to direct patients toward their therapies, wrote the researchers, with the added benefit of "increased efficiency of their arrival. These results should be interpreted as preliminary, but are rather exciting in their import."

Another benefit, Burke says, is that the system could help people with Alzheimer's disease and early stage dementia lead more independent lives.

In August, a second study will test the system in greater detail. This time, the researchers will give every patient in the brain injury unit a handheld device and retrofit every bulb in the unit and in related therapy areas. That study will give researchers a better idea of which patients benefit most from the system, Burke says.

Leeb envisions far more applications for his invention. Malls could direct the blind and befuddled alike. Airlines could turn their plane's cabin lights into a data network, without adding to the miles of wire.

"Fluorescent lights are everywhere," he says. "The infrastructure is already in place."

**Alan Leo is a staff editor at [technologyreview.com](http://www.technologyreview.com).**

### Related Links

[TR 100: Steven Leeb  
Rehab Robot  
Assistive Communications Systems  
How Do Fluorescent Lights Work?](#)

[Return to Top](#)

