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**Emerging Technologies**

# Five emerging sectors offer promise with new technologies

**By Jill Gambon**

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**Medical robotics**
The robotics industry in Massachusetts is nearly a $1 billion business, encompassing software, hardware, component-makers and other related companies, according to a report on the state's robotics industry by the Massachusetts Technology Leadership Council released earlier this year.

One promising segment of that industry is medical robotics, where robots are being developed to assist with rehabilitation, surgery and home health care, said Kathleen Hagan, president of Hagan & Co., a consultancy based in Boston that was involved in preparing the report. Robotics can help to improve the quality of care and drive down costs, Hagan said. Robotic-assisted surgery, for instance, can help doctors be more accurate and less invasive, which would help lower costs by speeding up recovery for patients, she said.

Some area companies working on medical robotics include Interactive Motion Technologies Inc. of Watertown, which was founded by MIT researchers Neville Hogan and Hermano Igo Kregs. The firm develops robots for assisting with rehabilitation therapy. Hocoma Inc., a small Swiss-based firm with U.S. headquarters in Rockland, has also developed robotic rehabilitation therapy systems for patients with neurological disorders.

Products to enable robot-assisted surgery are in earlier stages of development, with firms such as Cardiorobotics Inc., a venture-backed firm that has business and product development operations in Newport, R.I., developing robotics for minimally invasive cardiac surgery, as well as other applications.

While medical robotics hold out much promise, the sputtering economy could slow down development of the market, Hagan said. To ensure funding for continued research and development, the investment community needs to better understand the potential upside that robotics companies offer, she said.

**Light-emitting diodes**
While the recession has dimmed prospects for some local technology companies, firms developing light-emitting diodes remain a bright spot.

LEDs are semiconductors that produce light. They offer some basic advantages over traditional fluorescent and incandescent lighting, such as lower power consumption and longer life, although they are more costly. With market researchers projecting significant growth in LED lighting over the next few years, several Massachusetts companies have their sights set on creating new LEDs for general-purpose lighting and other applications.

In April, industry heavyweight Osram Sylvania opened a new facility in Beverly for developing LED technologies. Luminus Devices Inc. in Billerica has developed its PhlatLight LEDs for the general illumination-lighting, projection display (photo) and UV curing markets. QD Vision Inc., a developer of quantum-dot lighting, has unveiled its first commercial product, an LED lamp designed for home and office use. QD Vision, which has done much work developing technology for government customers, developed the lamp with Nexxus Lighting Inc. of Charlotte, N.C.

Beyond efficient lighting, researchers are looking at LEDs for next-generation wireless data networks. Under this scenario, LED-lights would be similar to wi-fi access points. Turning on an LED light in a room by flipping a  wall switch would not only illuminate the room it would also allow a laptop, handheld device or a thermostat to wirelessly receive data transmissions, said Boston University engineering professor Tom Little, of BU's Smart Lighting Engineering Research Center.

 "The goal is to do this in an energy-efficient way, without adding energy costs," Little said. BU is working with Rensselaer Polytechnic Institute and the University of New Mexico on the smart lighting project, funded by the National Science Foundation. Little envisions other applications that combine LEDs' lighting capabilities with data communications, such as using LEDs in car brake lights to improve safety. If, for instance, a car brakes unexpectedly, information could be transmitted to the cars behind it, via the LED network, warning drivers to slow down. "People are intrigued," he said. "But it's unproven at this point."

**Electronic readers and displays**
Among local companies, Cambridge-based E Ink Corp. has generated much of the buzz surrounding advancements in electronic displays as the supplier of the display for Amazon.com's high-profile e-book reader. The displays are designed to combine low- power consumption and lightweight form for a range of applications, from electronic books to clocks to supermarket signs to medical devices.

In June, Prime View International Co., a Taiwanese manufacturer of electronic readers such as the Kindle and Sony Corp.'s Reader, announced it was acquiring E Ink for about $215 million in cash. E Ink plans to stay in Cambridge, where it was spun out of MIT's storied Media Lab in 1997, and ramp up hiring in the coming months.

Andover-based Pixtronix Inc. is developing technology that uses a microelectro-mechanical system, or MEMS, to enhance the color and widen the viewing angle for mobile device displays, while reducing power consumption by as much as 75 percent over existing liquid crystal displays. Low-power consumption is key for mobile devices, which are increasingly being used for multi-media applications like movie-watching.

Last fall, the company, introduced a prototype of its PerfectLight display. Since then Pixtronix, which was founded in 2005 by president and CTO Nesbitt Hagood, has signed development agreements with multiple display manufacturers in Asia, according to Mark Halfman, vice president of marketing for the startup. In addition, the company last week announced $2.7 million in new funding.

**Telehealth**
Advances in networking, videoconferencing, database software and other technologies have combined to enable doctors and other health-care professionals to remotely monitor and track patients via computer systems and telecommunications networks across a medical campus or across the country. Proponents of telehealth applications say the systems can help improve the quality of care while keeping a lid on costs. With mounting pressure on providers to cut costs, many people expect telehealth systems to transform the way some health care is delivered.

Last year, the University of Massachusetts Memorial Medical Center launched a Tele-ICU project to study the outcomes of a system in which doctors remotely monitor intensive care patients. Nine intensive care units spread across several campuses are linked to a central ICU command center for round-the-clock monitoring. Early results show the project is saving money and improving the quality of care, said Cecelia Wu, program director of New England Healthcare Initiative, which is working with UMass Medical on the project. However, hurdles remain for broad adoption of systems like the Tele-ICU: namely the startup costs — which run upwards of $2 million to set up a system to monitor 100 beds. The lack of electronic medical records and resistance among some doctors could inhibit adoption, Wu said.

Patients may someday be using telemedicine for self-service health care. Under development by local researchers is a health-care kiosk that would allow patients to access their medical records to input health data and have vital signs like blood pressure recorded on a Windows-based desktop machine. The idea is to install the kiosks in pharmacies, supermarkets and other public places outside of hospitals for easy access, said Ron Dixon, a physician and lead researcher on the project and the director of the Virtual Practice Project at Massachusetts General Hospital. The Boston-based nonprofit Center for Integration of Medicine and Innovative Technology has provided funding for the development of the kiosks. The UK's National Health Service is launching a 60-day pilot to test the technology with patients. Dixon says automating some processes in monitoring patients' health should make the delivery of care more efficient. It is uncertain when the kiosk system would be rolled out in the U.S. The outcome of health-care

reform efforts could have an impact, Dixon said.

**Location-based applications**
Like most emerging technologies, the rise of location-based applications is being driven by a convergence of factors, including the proliferation of smart phones with GPS and wi-fi capabilities and the burgeoning availability of content such as restaurant reviews and travel information for mobile devices.

Technology market researcher Gartner Inc. projects that worldwide consumer location-based services will double in subscribers and revenue this year. The number of subscribers is expected to grow from 41 million in 2008 to 96 million this year, while revenue is projected to jump from $998 million to more than $2 billion, according to a Gartner report.

 "In the last couple of years, the capabilities of (mobile) phones have gone through the roof," said Dan Gilmartin, vice president of marketing for ULocate Communications Inc., a developer of location-based applications headquartered in Boston. The startup's Where application enables people to use their cell phones to track down friends or find stores, restaurants or other attractions.

Boston's privately held Skyhook Wireless Inc. is also benefitting from the growing appetite for location data served up on mobile devices. The company's software, which uses wi-fi, GPS and cell towers to deliver precise location data to support location-based applications, is offered for platforms including Apple Inc. iPhones and iPod Touch and Dell Inc. netbooks.

Some companies expect location-based applications will change the way people use their mobile phones. Intelligent Spatial Technologies, launched in Orono, Maine with plans to move to Portland, is developing the iPointer, a mobile search and content delivery system. With iPointer, mobile phone users point their handsets at buildings or landmarks, like they are using a television remote control, according to Intelligent Spatial Technologies. The iPointer system then delivers relevant pictures and information such as restaurant reviews from Yelp, to the mobile phone's screen. To ensure growth, applications like iPointer have to be simple to use, said Chris Frank, Intelligent Spatial Technologies founder and CEO. "If it's complicated or annoying, people won't use it again. The key is making it easier."

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