

Technology Radar: BusinessLab's review of technologies that are making the news, April 2011

An *ActiveAge* Report

Neural-controlled bionic legs

Over the past decade companies such as Cyberdyne¹ and Honda², have been using robotic technologies to develop exoskeleton systems to assist people with limited mobility.

However most of the technologies to date have been designed for people with limited use of their legs, and not for amputees using prosthetic legs. Current robotic support systems, such as those by Cyberdyne, look like wearable robotic skeletons.

These systems use nerve signals, sent from the brain to the muscles, to interpret the wearer's intended movement in advance of it actually happening. The musculoskeletal system then moves as a result.

Although scientists have been able to design prosthetic arms, which work in a similar way to the above robotic exoskeletons, neural controlled prosthetic legs have been a long-term challenge for scientists.

Now scientists at The Rehabilitation Institute of Chicago are close to developing a neural-controlled prosthetic leg.

Preliminary research shows successful neural control of both knee and ankle joints. The trial showed all participants were able to control their knee and ankle from neural information measured in the thigh. The average accuracy of movement rate was 91% for amputees and 89% for control patients.

Through real-time tests, all participants were instructed to move a virtual lower limb through a variety of motion patterns on a computer screen. Metrics were based on accuracy of movement, the time it took to complete the motion and the percentage of successfully completed motions.

The ultimate goal is to develop a prosthetic leg, which offers a greater range of motion than existing prosthetics. This would enable amputees to walk and go up and down stairs more safely.

For more information please visit:

<http://www.ric.org/aboutus/mediacenter/press/2011/lowerlimb042011.aspx>

¹ <http://www.cyberdyne.jp/english/>

² <http://corporate.honda.com/innovation/walk-assist/>

Retinal Implant a new device to restore eyesight

In the UK about 1 in 100 people aged 65-75, and about 1 in 8 people aged over 85 suffer from Age-Related Macular Degeneration (ARMD), which is severe enough to cause serious visual loss³.

In the USA approximately 9.1 million people over 40 suffer from the same condition⁴.

These statistics highlight the fact that ARMD is a serious issue for older people.

Scientists from the University of Southern California recently developed an innovative device to help people suffering from ARMD to regain their sight.

ARMD results in the loss of central vision due to damage to the macula, a central place in the retina, which has the largest concentration of cone cells. The cones are nerve cells sensitive to light, fine detail, and colour.

The device known as a bionic eye or retinal implant consists of a chip fitted behind the retina. The system works by converting video images captured from a miniature camera in the patient's glasses into a series of electrical pulses transmitted wirelessly to the chip, itself an array of electrodes.

These pulses stimulate the retina's remaining cells to communicate with the brain, which enables the patient to see again.

The device has been used by 37 patients in Europe and the US, who were completely blind for 25-30 years. Its developers are now making a cheaper version to take it to India and it's hoped the bionic eye will benefit many more people there.

For more information please visit:

<http://indiatoday.intoday.in/site/story/bionic-eye-a-device-developed-to-restore-eyesight-of-blinds/1/135556.html>

Laser ear implants could give deaf people the gift of hearing

A recent study carried out by The British Hearing Aid Manufacturers Association (BHAMA) indicates there are 3.4 million people in UK who suffer from hearing loss or cannot hear properly.

Only 39% of these people have a hearing aid. This means millions are battling with isolation, withdrawal, problems at work, depression and low self-esteem⁵.

Studies show that ageing is one of the main causes of hearing loss. A recent study by the John Hopkins University shows almost 90% of people in the USA, over the age of 80, suffer from hearing loss⁶.

However, a recent discovery by researchers from The University of Utah may soon help people suffering from hearing loss or deafness to partially regain their hearing.

³ <http://www.patient.co.uk/health/Age-Related-Macular-Degeneration.htm>

⁴ <http://www.maculardegenerationassociation.org/aboutmd/facts.aspx>

⁵ <http://www.prlog.org/11444981-are-gps-preventing-patients-from-hearing-properly.html>

⁶ http://www.msnbc.msn.com/id/41837919/ns/health-health_care/

Scientists at Utah have been using invisible infrared light to make rat heart cells contract and toadfish inner-ear cells send signals to the brain.

"We're going to talk to the brain with optical infrared pulses instead of electrical pulses," which now are used in cochlear implants to provide deaf people with limited hearing, says Richard Rabbitt, a professor of bioengineering and senior author of the heart-cell and inner-ear-cell studies published this month in *The Journal of Physiology*.

It's believe their discovery might someday improve cochlear implants for deafness and lead to devices to restore vision, maintain balance and treat movement disorders like Parkinson's.

The studies – funded by the National Institutes of Health - also raise the possibility of developing cardiac pacemakers that use optical signals rather than electrical signals to stimulate heart cells.

For more information visit:

<http://www.unews.utah.edu/p/?r=022211-4>

Canadians develop anti-crash system

According to a recent study divers over 70 are no more likely to cause crashes than any other age group, and they are considerably safer than younger drivers ⁷.

Despite these sorts of findings much debate still surrounds the question if and at what age people should stop driving.

Over the past few years we have seen many organisations, such as MIT AgeLab, carrying out intensive research to identify possible technologies to keep older people behind the wheel safer and for longer.

The most recent technology we have identified is an anti-collision system designed by Canadian researchers.

Scientists from the University of Windsor claim they have developed a low-cost anti-collision system, which has the potential to be installed in every vehicle on the road.

Although there are various anti-collision systems on the market, including those by luxury brands such as Mercedes, Volvo and Lexus, these technologies usually have a high price tag adding thousands to the cost of one of these branded cars.

According to Assistant Professor Sazzadur Chowdhury of Electrical and Computer Engineering at The University of Windsor, this new technology would only add about \$200 to a standard vehicle's cost and weigh considerably less than other devices.

So far this anti-collision system has attracted the attention of some of the major auto companies, such as Toyota North America and Magna Electronics.

For more information visit:

<http://www.windsorstar.com/Crash+proof+just+start+revolution/4643028/story.html>

⁷ http://www.iam.org.uk/latest_news/olderdriversarethesafestsaysiam.html