

Mobility

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FEATURE

DOCOMO Eyes a Future that Wears Well

The headphones sitting on the NTT DOCOMO researcher's head, looking anything but "state-of-the-art," are an awkward mess of sensors, cameras and wires. Is this clumsy-looking device really *the future of computing*?

Maybe.

The researcher, staring at a large screen, rolls his eyes clockwise and a digital music player on the screen responds by increasing the volume of the music track being played. Then a kind of visual ping pong begins as the scientist's eyes dart one way and the player fast forwards to the next song, then they dart in another direction and the music skips back to the previous track.

Controlling the operation of remote devices with the flick of an eye may sound like science fiction, but it's all in a day's work for Dr. Masaaki Fukumoto, Executive Research Engineer at NTT DOCOMO's Frontier Technology Research Group, where ongoing research promises to revolutionize the way we interact with technologies to make our daily lives more convenient and enjoyable.

Unlocking Existing Potential

This invisible connection between human and machine is just one of many possible applications for eye-movement sensor technology, explains Fukumoto.

In another experiment, the researcher casts his gaze on an optical code. Mirroring the eye's movements, the eye-sensor system locks onto the code and captures the image and its imbedded data. Someday this may be how we acquire product information, discount coupons, etc. for storage in our cell phones.

These are not very far-fetched ways to imagine us reading and managing e-mail, buying songs and products, and much more, says the DOCOMO scientist, because all he is doing is unlocking the potential of today's technology.

In the case of the headset, for example, he has adapted a medical device for measuring eye response, called an electrooculogram (EOG), which uses sensors to measure the electrical potential of the cornea and track where the eye is moving. Besides operating



Test system for operating software with one's eyes

a music player, the technology can be used to direct headset-mounted cameras to follow the eyes and show what the wearer is looking at.

As the first company to employ the technology in this way, “DOCOMO hopes someday to interpret the intentions of users to provide them with highly personalized services,” Fukumoto says.

Wearable Computing

Fukumoto envisages, and his work presages, a foreseeable future of “wearable computing,” when seamlessly linked discrete devices will help to break down barriers between humans and machines.

While DOCOMO’s advanced, multifunctional mobile phones can operate as keys, credit cards, entertainment and information devices, and of course communication tools—representing the cutting edge of technological convenience—the fact remains they still do not have sufficient space for a full keyboard, a barrier that needs to be overcome.

For several years, the company has been researching and developing multifunctional devices that transcend barriers by expanding the human-machine interface. Think of the UbiButton, DOCOMO’s prototype wristwatch that detects finger movements, which could be adapted for a virtual keyboard, or the Yubi-Wa, a wearable device that turns the finger into a phone receiver.

“Our research is focusing on wearable computing, in other words, multifunctional mobile phones designed as wearable gadgets. Someday we will wear very small devices that become part of us, much like fashion accessories,” he says.

Fukumoto even envisages wearable mobile phones

serving as core computing devices, possibly even hubs, providing us with broad information and communication capability via tiny yet powerful devices that we interact with seamlessly.

Putting it All Together

From the look of it, much of Fukumoto’s work doesn’t seem to be on the verge of commercialization. The current version of the headset, for example, is both unwieldy and unsightly. And when a group of foreign media visited the lab recently, the music player demonstration went well, but the code reader missed several times and the sensors, although mostly working fine, seemed a bit sluggish and error-prone.

Is this technology really ready to market?

Well, firstly, points out Fukumoto, improving the accuracy and responsiveness of the EOG technology is more a matter of degree than a major issue, as the core concepts and functions have been proven already.

The current test device is no more than an assemblage of items available at any good electronics shop. “What we have here is more like a homemade project. But with custom parts, it would not be difficult to shrink this and turn it into something marketable,” he explains. A stylish headset capable of controlling other devices and reading codes could easily be on the market in “a few years.”

Before this happens, of course, viable business models will have to be developed along with the necessary systems and infrastructure. But if DOCOMO does decide to proceed to commercialization, a first generation of tomorrow’s wearable info-communication products could be closer than you think.

Where it All Starts



Dr. Masaaki Fukumoto

The synthesis of discrete technologies into useful, next-generation systems is the unending goal of Dr. Masaaki Fukumoto and the Frontier Technology Research Group at Yokosuka Research Park, Japan’s famous corporate R&D village of laboratories and institutes located about an hour’s train ride south of Tokyo.

Over the last few years the laboratory has produced a number of inventions that have propelled DOCOMO closer to Fukumoto’s vision of wearable computing.

In 2004, Fukumoto introduced the UbiButton, which is worn like a wristwatch and is used to operate other devices, such as lights, at the snap of one’s fingers. He also unveiled the Yubi-Wa, a transceiver resembling an oversized ring that is worn on the index finger. When the finger is inserted into the ear, the Yubi-Wa uses bone-conduction technology to turn electronic vibrations into sound, a novel concept that attracted international attention at the CEATEC exhibition in 2005.

Although DOCOMO is not a manufacturer, its research and development function remains crucial to its status as a leading driver of cutting-edge products, services and technologies for mobile communications.

DOCOMO interTouch

DOCOMO interTouch Pte. Ltd., a wholly owned DOCOMO subsidiary headquartered in Singapore and providing managed integrated-technology services to the global hospitality industry, announced in April that its name had changed from interTouch Pte. Ltd. to DOCOMO interTouch. As part of the change, the company will introduce a new logo on July 1.

Since DOCOMO's acquisition of interTouch in 2004, the company has been working in cooperation with DOCOMO toward the integration of mobile and hotel-broadband services to provide international business travelers with more convenient broadband connectivity.

In January, just prior to the renaming, interTouch wholly acquired Singapore-based MagiNet Pte. Ltd., a provider of high-speed-broadband connectivity services and video applications to the hospitality industry.

DOCOMO interTouch now delivers reliable and secure wired and wireless broadband connectivity services, video-on-demand, interactive television, voice, multimedia and other managed network solutions in the world, serving approximately 1,000 hotels in 62 countries and areas of Asia Pacific, Europe, Africa and the Middle East, with a growing presence in the Americas.

DOCOMO interTouch is committed to expanding and upgrading its offerings and enhancing the guest experience under the DOCOMO brand to provide the industry's most convenient and reliable communication, information and entertainment services to hotels worldwide.

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Singapore's interTouch Renamed DOCOMO interTouch

TELECOMMUNICATIONS RESEARCH By InfoCom Research, Inc.

Online Shoppers Are Going Mobile

At a time when online shopping with PCs has become quite common, it should come as no surprise that the ubiquitous cell phone is gaining popularity for Internet purchases.

A recent InfoCom survey found that 40% of Japanese consumers have purchased goods or services online, including 60% of females in their 30s. Clearly, shopping via one's PC is now an established trend.

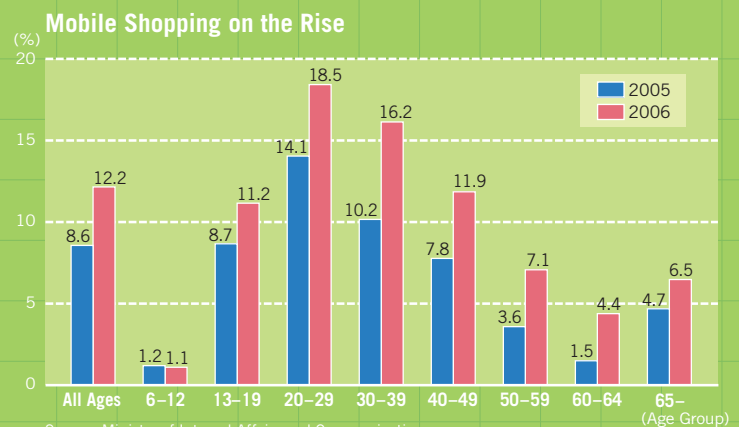
In the case of mobile shopping, however, many consumers initially were skeptical due to small handset screens and significant differences between how things looked on screen and in real life. At the time, many thought that mobile shoppers would only purchase items that they already were familiar with, but not to search for and buy items.

But thanks to increasing functionality, larger screens and faster speeds, mobile phones are now viewed as handy tools for finding items, as well as purchasing them.

According to the latest available results of the Communication Usage Trend Survey carried out by the Japanese Ministry of Internal Affairs and Communications, mobile shoppers rose 3.6 percentage points—more than double the 1.7-point increase among PC shoppers—between 2005 and 2006.

While users in their 20s and 30s are most likely to shop by cell phone, mobile shopping is becoming increasingly accepted among all age groups.

In the future, the growing use of mobile phones for quick, easy payments in stores and other payment functions will surely strengthen the perception of the mobile phone as a convenient tool for shopping.



DOCOMO Launches New Logo

NTT docomo NTT DOCOMO on April 18 unveiled its new corporate logo and other re-branding elements, which will be introduced beginning July 1.

The re-branding is the result of an extensive review of branding and marketing strategies following the establishment of the Corporate Branding Division in August 2007.

DOCOMO decided to introduce the new brand to communicate to stakeholders the company's reinforced commitment to understand customers and build stronger relationships with them, as well as maximize workforce creativity and remain a leading innovator of mobile technologies.

The new logo's red color expresses not only the company's energy and dynamism, but also its heartfelt desire to provide customers with true satisfaction.

The logo and new brand slogan—Unlimited Potential, in Your Hand—also express DOCOMO's commitment to offer high-quality, value-added mobile services and technologies that enhance human relationships and lifestyles.

Homebuilder Incorporates DOCOMO's E-Wallet Technologies

Sekisui House, Ltd., a major Japanese homebuilder, has adopted DOCOMO's Osaifu-Keitai™ mobile e-wallet technologies for a networked-home security system that greatly expands the usefulness and practicality of mobile phones.

Sekisui House introduced the system, the first of its kind, in new homes sold in Tochigi Prefecture, north of Tokyo, in April.

The system enables mobile phone users in remote locations to lock/unlock doors, as well as confirm that doors are locked. E-mails can be sent to handsets whenever a family member returns home. Photos of anyone who pushes the front-door intercom (see graphic), or is detected via a surveillance camera, also can be e-mailed. Other conveniences include remote operation of lights, air conditioners and window shutters. For extra security, lost phones can be quickly deactivated by DOCOMO on a 24/7 basis.



DOCOMO DATA

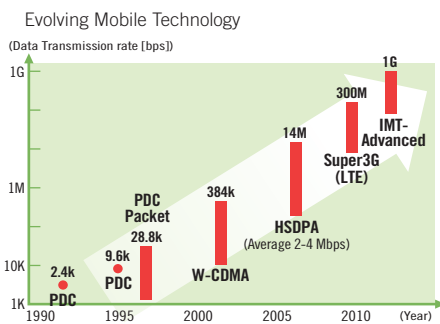
Mobile Data Rates Continue to Pick up Speed

DOCOMO's history of pursuing increasingly faster wireless transmission rates goes back to the 1970s, when its parent, NTT Corp, introduced Japan's initial first-generation (1G) analog mobile voice service.

In 1993, DOCOMO launched a 2G digital mobile service capable of data transfers at 2.4Kbps, and then in 1995 it started a packet-data service with speeds up to 9.6Kbps. Younger people might be surprised to learn that this was called a "high-speed" mobile service back then.

Today, DOCOMO customers enjoy maximum packet-communication speeds of 384Kbps using W-CDMA, a 3G technology, or either 3.6Mbps or 7.2Mbps (depending on the handset) using HSDPA, which began in 2006 and is now available in 96% of Japan's inhabited areas.

Looking ahead, DOCOMO plans to enhance its cellular network with Super3G (LTE) technologies that will offer speeds up to 300Mbps, while also studying more advanced mobile systems that someday promise to deliver an amazing data transmission rate of 1Gbps.



March 25, 2008 ▶ Downlinks with DOCOMO's FOMA™ HIGH-SPEED service were upgraded from 3.6Mbps to 7.2Mbps (best effort) on April 1. The service, which does not require registration or any additional charge, offers extra-fast packet communications for compatible handsets in areas serving 90% of Japan's population.

March 26, 2008 ▶ DOCOMO achieved a downlink speed of 250Mbps during an outdoor test of an experimental network based on Super3G, the expected successor of HSPA mobile systems. Four Multiple-Input Multiple-Output (MIMO) antennas were used to transmit from a base station to a mobile station in the 20MHz bandwidth.

March 27, 2008 ▶ DOCOMO and the University of Tokyo have jointly demonstrated the world's first molecular delivery system in which molecules are used as a communication medium. Someday the technology may be used to transmit information about biochemical conditions of living organisms, such as excitement, emotion, stress or disease.

April 15, 2008 ▶ Conexus Mobile Alliance, a major Asian alliance of mobile operators including DOCOMO, launched the Asia-Pacific's first pay-per-day flat-rate data roaming tariff plan, providing many customers across seven countries with predictable, cost-effective mobile connectivity to check e-mail, transmit data or surf on the Internet as they travel.

April 21, 2008 ▶ DOCOMO will develop an operator pack for FOMA 3G handsets based on Linux® specifications, freeing phone makers from having to develop applications to implement i-mode™, i-appli™ and other unique DOCOMO services, as well as helping them to produce handsets that they could market outside of Japan.

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Linux is the registered trademark of Linus Torvalds in the U.S. and other countries.

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