RESEARCH AND DEVELOPMENT

Aiming to Contribute to Society through the Development of Advanced Technology

The OKI Group actively develops and introduces cutting-edge technologies with the aim of creating products that contribute to the advancement of today's information society. Our research and development activities focus on the three core fields of mechatronics, info-telecom, and human media.

1 Mechatronics

The field of mechatronics comprises technologies that support OKI's mainstay products, including ATMs, cash handling equipment, and printers, and is one in which OKI has acquired technologies over many years. We constantly improve existing technologies used for ATMs and other cash handling equipment. We employ magnetic, optical, and other technologies appropriate for each medium to develop high-speed and high-precision sensing technologies, which we then use for various practical applications, such as recognizing various banknotes. In order to produce compact, high-resolution printers with low power consumption, OKI is currently developing new-generation LED printheads that integrate LEDs, optical systems, and control chips. This technology can be channeled into a wide range of applications for LEDs, and has exciting potential in the area of cutting-edge displays. OKI also works on enhancing basic printer functions, such as improving mechanical precision and print quality.

2 Info-telecom

Today, when the adoption of optical broadband is spreading globally, low power consumption is becoming an increasingly important requirement for optical broadband devices. We draw on silicon photonics and other advanced technologies to develop a power-saving home optical broadband device based on OKI's proprietary architectures and an ultrasmall optical broadband terminal that can be adopted by all kinds of terminal equipment.

OKI also aims to build network environments through convergence with wireless networks. At the same time, we are developing new algorithms that estimate, monitor, and control content sent via networks to meet demand for higher quality and more reliable network services.

3 Human Media

In the area of human communication, advances in network environments have enabled remote communication that transcends geographical constraints. OKI seeks to realize ultra-realistic communication that enables people in faraway offices or classrooms to interact with one another so that they feel as if they are actually somewhere else. To this end, OKI conducts research on the transmission of information that creates such "atmosphere" by combining the separation of specific sources of sound, video, and other contextual information, as well as research on ergonomic evaluation of it.

Autonomous Mobility Support Experiment Held Using "eSound™ Positioning"

Ubiquitous Communicator

OKI and the YRP Ubiquitous Networking Laboratory conducted an experiment in Tokyo's Ginza district as part of the Tokyo Ubiquitous Technology Project sponsored by the Tokyo Metropolitan Government and the Ministry of Land, Infrastructure, Transport and Tourism. The experiment, which called for private sectors' participation, was held to test an autonomous mobility support for the visually impaired.

For the experiment, OKI's "eSound Positioning" was incorporated in an Ubiquitous Communicator*1 developed by the laboratory to test the effectiveness of ubiquitous navigation using only sound. In real environments, there is subtle difference in the characteristic of sound that reaches the right and left ears depending on the direction of the source. We are able to detect the direction of the source by this difference. "eSound Positioning" virtually reproduces this directionality of sound (sound localization) based on minute differences in characteristics using signal processing so that voices of multiple speakers are heard from different directions. In the experiment, a participant carrying an Ubiquitous Communicator received ucodes*2 sent from active tags on wireless markers and infrared markers placed around Ginza. The ucodes gave the Ubiquitous Communicator information on the current location of the user. Direction sensors attached to the Ubiquitous Communicator then calculated the direction from the user's current location to their destination using the direction in which the user was facing and the latitude and longitude of the destination. Next, using this data, the user received navigation audio message via bone-conduction headphones connected to the Ubiquitous Communicator, which was heard from the direction of destination.

People who took part in the experiment said the navigation audio provided by "eSound Positioning" gave them a sense of direction, which enabled them to instinctively recognize the direction in which they were walking.

*1 **Ubiquitous Communicator:** Terminal that allows people to communicate with an ubiquitous computing environment
*2 **ucode:** A unique ID given to identify each "object" and "place"

LED Printhead Developed Using Intermolecular Forces Bonding of DLC Layer and Semiconductor Single-crystal Thin Film

OKI Digital Imaging, YOUTEC CO., Ltd., and CRYSTAL OPTICS INC. have developed a next-generation LED printhead that bonds a high-heat-dissipation substrate and an LED by using intermolecular forces. This development was part of a NEDO*1 project entitled "R&D on Commercialization of Nanotech and Leading-Edge Materials," carried out from 2007 through 2009. Conventional LED printheads have the drawback of thermal conduction because the LED array is mounted on the substrate using an adhesive paste. In the case of the new printhead, an insulative, highly heat-conductive DLC*2 is used to form a nanoscale smooth surface on a highly heat-conductive substrate with a surface that has been planed to a tolerance of 1 nanometer. The LED array is bonded directly to the substrate using the intermolecular forces that act on the surface of the DLC. The process is expected to significantly improve heat dissipation compared with conventional structures.

The rise in temperature is reduced to less than one-fifth and luminescent output is more than twice that of conventional LED arrays. The result is an A4 1200dpi printhead with twice the integration density of conventional structures.

In the joint-development process, OKI Digital Imaging was in charge of the intermolecular force bonding technology that bonds the DLC thin-film and the single-crystal thin film, as well as the LED printhead technology.

*1 **NEDO:** New Energy and Industrial Technology Development Organization
*2 **DLC:** Diamond Like Carbon

MANUFACTURING PROCESS