

Commencement of Operation of Toshiba's Smart Community Center

Toward Realization of a Smart City

TAKITOGÉ Masasuke

Toshiba's Efforts Aimed at Realization of Smart Building Contributing to Creation of Smart Communities

YAMAMOTO Kazumoto

In office buildings, which consume large amounts of energy, further energy saving and reduction of power consumption, electric-load leveling, and improvement of response capabilities for business continuity plans (BCPs) have become increasingly important as countermeasures against the shortages of electricity since the Great East Japan Earthquake. In response to these circumstances, the Toshiba Group has been engaged in the development of a smart building applying the following technologies: (1) technologies for high-efficiency building facilities; (2) new energy equipment utilizing renewable energy and electricity storage systems; and (3) the "Smart BEMS," which realizes an optimal building energy management system (BEMS) technology through integrated management of each building facility and the use of advanced sensing technologies. We have introduced these building solutions to achieve comfort and energy saving during normal operations of the building and ensure safety and security in the event of a disaster to the Smart Community Center, which commenced operation as the base for our smart community business on October 31, 2013. We are also promoting the development of clustered BEMS technology as well as cloud-based energy management services for small and medium-size buildings. Our objective is to construct smart communities by providing building solutions ranging from those for a single building to comprehensive management of groups of buildings and the overall area.

Latest Elevators and Escalators Designed for Superior Comfort and Low Power Consumption

TANIMOTO Tatsuyoshi / SUZUKI Hidemitsu / HAKOZAKI Katsunori

Elevators and escalators with low power consumption and superior comfort based on accurate control systems were required for an advanced environmentally friendly office building called the Smart Community Center, which achieves a balance between comfort and energy-saving and serves as the base for Toshiba's smart community business.

To fulfill these requirements, Toshiba Elevator and Building Systems Corporation developed a system that realizes interlocking between elevators and building facilities including image sensors and the building energy management system (BEMS). We also supplied our advanced SPACEL-GR™ and Kindmover™ environmentally conscious elevators and escalators, which provide enhanced energy-saving performance and safety.

Air-Conditioning Systems Optimized for Large-Scale Office Spaces Providing Comfort and High Energy Efficiency

IJJIMA Shinichi

To achieve a balance between comfortable air conditioning and energy saving for large-scale office spaces, Toshiba Carrier Corporation has been engaged in the development of air-conditioning systems for building use through experiments on balcony-installed outdoor units and simulations of indoor temperature distribution for floor airflow design, in cooperation with users at the initial stage of development.

We have supplied air-conditioning systems optimized for an advanced environmentally friendly office building called the Smart Community Center by combining central and individual air-conditioning systems. For the central air-conditioning system, we adopted the Universal Smart X™ (USX™) heat pump unit with high energy efficiency and excellent partial-load efficiency as well as a floor airflow design to introduce fresh air into the building. For the individual air-conditioning systems, we adopted the SMMS-i™ multi-split air-conditioning system, which has high responsiveness to cooling and heating loads, as a variable refrigerant flow (VRF) system to air-condition multiple spaces individually. By installing outdoor units and fresh air intake systems on each floor, we achieved a unique air-conditioning system offering comfort and high energy efficiency.

Creation of Comfortable Energy-Saving Offices Using Leading-Edge LED Lighting and Control Systems

OTA Masaaki / KONDO Seiji

On average, approximately 40% of the electricity consumed by the office areas of a building is for lighting. To further improve the energy-saving performance and comfort of lighting, it is necessary to enhance the efficiency of lighting fixtures and to optimize the lighting control system beyond the limits of conventional methods. By combining the lighting control system with a building energy management system (BEMS) connected to other facilities including the air-conditioning system, it has become possible to offer high-value-added building solutions.

In order to increase the overall utility of lighting facilities, The Toshiba Group has developed highly energy-efficient light-emitting diode (LED) lighting, a new sensing technology, a lighting control system that flexibly responds to a variety of office operations, and high-value-added functions for interlocked control and central management between the lighting control system and BEMS. These technologies have been introduced in the Smart Community Center, an advanced environmentally friendly office building that was completed in March 2013 and in which operations commenced in October 2013.

Indoor Modular Data Center Offering Best Solution for Buildings

SATO Kazuhide / UCHIHORI Ikuo

Information systems utilizing information and communication technologies (ICTs) are essential to modern life, and data centers operating such systems have become increasingly important as a key element of social infrastructures. However, these data systems have recently been facing various issues including increases in initial investment costs and the need for energy-saving measures.

As a solution to this situation, Toshiba has developed the Toshiba Indoor Modular Data Center, which offers a modular data center solution for building use that makes step-by-step deployment and energy-saving operations possible through its modular structure and the use of the latest air-conditioning systems. We have also developed the Toshiba Total Storage Platform as an ICT, realizing a storage system with high efficiency that offers energy and space saving for data centers. We have completed the implementation of these new technologies for the data center supporting the Smart Community Center, which is an advanced environmentally friendly office building in Kawasaki. These technologies combining facility solutions with modular data center and ICT solutions are expected to contribute to the construction of robust social infrastructure platforms.

"Smart BEMS" Ensuring Safety and Security of Building while Achieving Balancebetween Comfort and Energy Saving

ASAZUMA Tomohiro

In the construction of the Smart Community Center, an advanced environmentally friendly office building, there was a strong requirement for higher energy-saving performance through optimal control of the building facilities, including air-conditioning systems, lighting facilities, elevators, and escalators, by means of building energy management system (BEMS) technologies. Applying its proprietary BEMS technologies, Toshiba developed the "Smart BEMS" system to achieve energy saving and comfort during normal operations of the building and ensure safety and security in the event of a disaster. With various functions incorporated into our conventional BEMS, including (1) a model-based optimal air-conditioning control function, (2) interlocking control functions for air conditioners, lighting facilities, elevators, and escalators using image sensors, (3) a peak cut/peak shift function, and (4) a business continuity plan (BCP) function, Smart BEMS can reduce the energy consumption of the whole building by 11% and secure electricity supplies for three days in the event of a blackout.

System for Dividing Web Pages into Subpages Displayed on Multiple Devices Using HTML5 Structure Transformation Technology

SAKAI Narumichi / MINEMATSU Mika / AIZU Hiroyuki

With the wide dissemination of various network-connected digital devices equipped with a display, including smartphones and smart TVs, many users now own a number of such devices. New Web experiences such as collaborative work and large virtual workspaces are available with the effective combination of these multiple displays. For example, by dividing an existing video viewing page into a video replay page for a TV and a play button page for a smartphone, users can remotely control the video on TV from their smartphone.

To enhance the convenience of Web pages, Toshiba has developed a Web-page-display division system using an HTML5 (HTML: Hypertext Markup Language) structure transformation technology that makes it possible to divide a Web page into subpages and display them cooperatively on multiple devices.

Glasses-Free Medical 3D Display System

KOKOJIMA Yoshiyuki / TSUKAGOSHI Shinsuke / SUZUKI Masahiro / NARITA Yoshitaka

In conventional medical display systems, it is difficult to display three-dimensional (3D) structures in medical 3D images acquired by computed tomography (CT) scanners. Surgeons must therefore recognize the 3D structure with its complex overlapping of blood vessels by integrating images observed from various angles before and during the operation.

Toshiba has developed a medical 3D display system for CT scanners utilizing an integral imaging (II) technology acquired through the development of the glasses-free 3D REGZA series TVs. This medical 3D display system makes it possible to intuitively recognize 3D structures in 3D CT images without the need for dedicated glasses by employing a parallax control algorithm in order to improve depth perception on the 3D display. We have confirmed the effectiveness of this system through verification tests performed by radiologists with extensive experience in observing 3D CT images at the National Cancer Center Hospital.

LC GRIN Lens Technologies Broadening Glasses-Free 3D Display Applications

TAKAGI Ayako / KASHIWAGI Masako / UEHARA Shinichi

Glasses-free three-dimensional liquid crystal displays (3D LCDs), which can display 3D images without the need for dedicated glasses, are expected to be used not only for watching 3D images and movies but also various other applications including the medical and digital signage fields. In addition to the conventional 2D/3D switching mode, demand has been growing for a partially switchable 2D/3D mode, as well as for a rotatable 2D/3D mode for changing between landscape and portrait orientations. Liquid crystal gradient-index (LC GRIN) lenses are suitable for these new applications because their lens characteristics can be easily changed according to the electrode structure and driving method used.

Toshiba has developed LC GRIN lens technologies for glasses-free 3D LCDs that realize the partially switchable 2D/3D mode and screen orientation switchable mode. We have confirmed the effectiveness of LC GRIN lenses incorporating these modes through simulations and experiments using prototype glasses-free 3D LCDs. These technologies will be applied to various applications.

Attention-Focusing User Interface Using Markerless Image Recognition Technology to Connect Real World to Cloud Computing

NISHIYAMA Masashi / OHIRA Hidetaka / SEKINE Masahiro

Expectations are rising for the realization of a new lifestyle providing a seamless connection between real objects and a wide variety of contents accessible by cloud computing.

Toshiba has developed an attention-focusing user interface (UI) that offers a new service for connecting real objects to digital data on the Internet. The attention-focusing UI is required to quickly and correctly recognize objects around users. However, conventional technologies that achieve image recognition of an object without markers such as a bar code or QR code have several problems, such as the high computational cost and long processing time required to extract the features of the object from the image. To overcome these problems, we have developed a new markerless image recognition technology for extracting region-based edge features that can quickly and robustly recognize objects and extract the registered data. We have conducted verification tests using smartphones and tablets and confirmed that an object recognition accuracy of 99% is achieved with a response time of 0.5 seconds.

Development of IEC 62656 Series Standards and Their Applications

HOSOKAWA Akira / MURAYAMA Hiroshi

The role of international standards has become increasingly important as a common intellectual resource for the international community to realize interoperability among different systems. A number of technical committees (TCs) and subcommittees (SCs) of the International Electrotechnical Commission (IEC) and the International Organization for Standardization (ISO) have been engaged in developing a series of international standards to describe the characteristics and performances of the domain-specific products and services related to each TC/SC, as an electronic file called a "data dictionary" or "ontology." Toshiba has led the development of the IEC 62656 "Standardized product ontology register and transfer by spreadsheets" series standards, or so-called "Parcel standards," and has also developed ParcelMaker™ as a reference tool. These standards and tool enable users to exchange and store specifications and performance characteristics of their products, including those in the chemical and electric power industries, in a way that is compliant with international standards. They can also contribute to the creation of a database of all specifications of products in industrial plants or the social infrastructure field.

"REGZA Engine CEVO 4K" Video Processing Engine Realizing High Picture Qualityin 4K Ultra HD TVs

SATO Ko

The popularization of liquid crystal display (LCD) TVs with a large display has led to an increase in the number of display pixels. Since Toshiba launched its REGZA 55X3 model, the world's first 4K ultra-high-definition (Ultra HD: 3,840 x 2,160 pixels) LCD TV, in December 2011, the market for 4K Ultra HD TVs has been growing with new model releases from other companies. In Japan, studies in response to the increase in video signal resolution toward the early realization of 4K Ultra HD TV broadcasts are being conducted under the initiative of the Ministry of Internal Affairs and Communications, and further expansion of the 4K Ultra HD TV market is anticipated in the future.

To meet the demand for high picture quality for such high-resolution TVs, Toshiba has developed a new video processing engine called the "REGZA Engine CEVO 4K" to deliver superior picture quality appropriate for a 4K Ultra HD TV. The REGZA Engine CEVO 4K makes it possible to improve various aspects of picture quality processing, from the 4K super-resolution processing to the frame rate conversion processing, with all of its functions integrated in one chip.

Technology for Quality Improvement of Metal Castings Using Casting Simulation

"Shape3D" Advanced 2D to 3D Conversion Technology to Automatically Extract Human Outlines in 2D Images