

TOSHIBA REVIEW

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Special Reports

Proposals for the Future from Toshiba on Its 130th Anniversary

For the Heart

YASUDA Hiroshi

Audiovisual Devices That Astonish and Impress Users

KAMITAKE Takashi

Society has now entered the ubiquitous network era, in which people can enjoy digitized audiovisual contents anywhere and anytime. Toshiba has three concepts for the development of digital products: "HDstyle", "gigastyle", and "Netstyle". HDstyle aims to develop high-definition digital devices, while gigastyle is targeted at gigantic-capacity hard disk drives. These two styles of products are linked with core digital products such as notebook PCs and mobile phones via networks in an interactive environment, thereby forming Netstyle. We are always aware that it is people who are at the center of these networks, and we are making every effort to develop people-friendly, easy-to-use products that will astonish and impress users.

Toshiba is also working to create new values around key devices and key materials that provide a backbone for the innovation and evolution of electronics technology. These include the surface-conduction electron-emitter display (SED), which is the next-generation high-resolution flat panel display; the CELL processor, which generates sharp and high-quality moving images; long-life batteries for mobile devices; and so on.

Evolution of Flat Panel Display TVs

-Higher Picture Quality and Next-Generation Network Technology

OHIRA Yoshifumi / SHIGIHARA Hideo

Cathode ray tube (CRT) television sets are now rapidly being replaced by flat panel display models, in line with the shift from analog to digital broadcasting. Toshiba has been involved in the development of CRT-based TVs since their inception, and has long been taking the same steps as the television industry. The TV products in our history, and the technologies that have realized them, embody our consistent objective of providing an impressive audiovisual (AV) experience to as many customers as possible. In this new era of flat panel display TVs, this objective has given birth to our new "meta brain" circuit. We have applied our latest picture enhancement technology and next-generation network technology to "meta brain."

Technologies of HD DVD Next-Generation Optical Disc

NAGAI Koichi / SATOH Hiroharu

Within the DVD Forum, which made the conventional DVD. Toshiba is developing the HD DVD, a next-generation optical disc that will be used to record high-definition movies. HD DVD has high compatibility with DVD, meets the requirements for next-generation discs, and its discs and equipment can be easily manufactured at low cost. Interchangeability between read-only discs and recordable discs is also improved. Internet connectivity and adoption of advanced programming language makes it possible to provide richly expressive contents. HD DVD is therefore highly attractive to consumers.

Expanding Installation of Small-Form-Factor HDDs in Ubiquitous Equipment

YAMAMOTO Kotaro

Due to recent technological innovations, hard disk drive (HDD) recording density has achieved sufficient capacity to enable the use of HDDs in various types of ubiquitous equipment. These small-form-factor HDDs are opening up new markets for ubiquitous equipment such as HDD audio players.

Notebook PCs for Next Twenty Years

BABA Shinichi / MATOBA Tsukasa

Since its introduction of the world's first laptop PC 20 years ago, Toshiba has been continuously developing advanced notebook PCs incorporating original technologies. In particular, in 2004 and 2005 we have launched on the market a brand-new audiovisual (AV) notebook PC with real AV functions as well as new-generation slim and mini notebook PCs.

This paper describes these notebook PCs equipped with the latest technologies and features, including high picture quality, improved usability, high reliability, high-density circuit board design, and security, which are earning high evaluations and trust of users. These products will become the foundation of notebook PCs for the next 20 years.

Evolution and Technical Trends of Mobile Phones

NANNICHI Toshihiko

Mobile phones have now become a vital tool in society as shown by the large number of subscribers, with more than 70 % of the Japanese population using mobile phone services. Today's mobile phones are not only used for voice communication, but incorporate a host of features such as messaging, video telephony, camera, music player, TV, games, railway tickets, and mobile wallet in one small device. As a result, mobile phones have become a key device for ubiquitous computing.

Toshiba keeps providing advanced mobile phones by developing latest core technologies that ensure these functions.

Software That Delights and Surprises Users

IZUMI Yuji / SHIMIZU Nobuo / TANAKA Sayoko

As the network environment surrounding digital audiovisual (AV) products evolves and the performance of individual hardware devices improves, the software inside these products is becoming increasingly complex and larger in size, and increasingly important as well.

In particular, the software fields that delight and surprise users include video streaming, audio processing, and human interfaces. Good examples that take advantage of the elemental technologies in these software fields are the Ubiquitous Viewer and recommendation technology.

Development of Video Coding Technology and Future Prospects

CHUJOH Takeshi

The history of the development of video coding technology is also the history of international standardization since the mid-1980s. Toshiba has contributed to these international standardization activities and developed a large number of products using these technologies. MPEG-4 is a standard in which future development (especially that pertaining to error resilience tools) is expected, and H.264/MPEG-4 AVC (Advanced Video Coding) is an important recent standard. New standardization activities are currently progressing and there are expectations for the further development of video coding technology.

Mobile Broadcasting Service

SATO Nobuyasu / OSAKO Toshiki / OGAWA Masatoshi

Mobile broadcasting is the first commercial digital broadcasting service that can provide audio, picture, and data broadcasts to mobile users. Since its official launch in October 2004, various new services have been offered including relay broadcasts of baseball games, grand sumo tournaments, marathons, and motor races. Moreover, many of the people affected by the Niigata Prefecture Chuetsu Earthquake, which occurred on October 23, 2004, were able to receive information via mobile broadcasting. The system is therefore expected to play a significant role in disaster prevention and emergencies, in addition to the broadcasting of programs.

Toshiba is aiming to bring mobile broadcasting closer to more people by broadening the range of users able to receive its services, from passengers in land vehicles to those traveling in aircraft and marine vessels as well.

SED--Next-Generation Flat Panel Display

NISHIMURA Takashi / MURATA Hirotaka

In collaboration with Canon Inc., Toshiba has been developing a surface-conduction electron-emitter display (SED) as a promising next-generation large-screen flat panel display. A 36-inch (visual size) prototype SED was exhibited at CEATEC JAPAN 2004 in October 2004. Based on the same light-emitting principle as the cathode ray tube (CRT), the SED inherits the reputable picture quality of the CRT but with improvements in sharpness and other characteristics. A striking feature of the SED is its high dark room contrast, which makes superior expression of black possible. Very low power consumption is another superior feature from the standpoint of reducing the effect on the environment. From now on, we aim to disseminate the SED widely so that large numbers of users can be astonished and impressed by its excellent picture quality.

High Imaging Quality Based on Optically Compensated Bend Mode Liquid Crystal Technology

TAKIMOTO Akio / WAKEMOTO Hirofumi / NAKAO Kenji

Toshiba Matsushita Display Technology Co., Ltd. was the first company in the world to succeed in the mass production of optically compensated bend (OCB) mode liquid crystal display (LCD) panels, which have excellent moving picture quality almost equivalent to that of a cathode ray tube (CRT). We have newly developed a 32-inch-diagonal LCD panel (1,366 x 768 pixels) using OCB mode and low-temperature polycrystalline silicon thin-film transistor (LTPS-TFT) array substrates. High performance, with a brightness of 600 cd/m² and a contrast ratio of 600:1, was obtained by using the pseudo-impulse driving method to insert a black period between two continuous frames, and also by using the blinking backlight method.

Micro Fuel Cell for Mobile Devices

OHZU Hideyuki / HASEBE Hiroyuki / UENO Fumio

Toshiba has developed a prototype of a highly compact direct methanol fuel cell (DMFC) that can be integrated into devices as small as digital audio players or wireless headsets for mobile phones. With dimensions of only 22 x 56 x 4.5/9.1 mm, the slim prototype DMFC is as long and wide as a thumb, a size advantage that will give greater design freedom to developers of handheld electronic devices. The total weight of this prototype DMFC is only 8.5 g, allowing it to be integrated into a wireless headset for a mobile phone, yet it is still efficient enough to power an MP3 music player for as long as 20 hours on a single 2 cc charge of pure methanol. The new fuel cell outputs 100 mW of power, and can continue nonstop operation indefinitely as long as the user tops up its integrated fuel tank. The process that is both simple and safe.

Overview of CELL Processor Architecture for Next-Generation Digital Home

KONDOH Nobuhito

The CELL processor has been developed with the aim of realizing a "supercomputer on a chip." It incorporates an advanced multicore architectural design with eight synergistic processor elements (SPEs) for floating-point processing and one power processor element (PPE) for general-purpose processing packed onto a single chip. Next-generation digital consumer electronic products, such as HDTV and HD DVD, require much more computing power. Real-time processing performance is important on these platforms. CELL architecture meets the real-time processing performance needs of broadband rich media applications.

Technologies of Assuring Safety and Peace of Mind

Social Infrastructure Assuring Safety and Peace of Mind

TAI Ichiro / OKUZUMI Naaki

Safety is the first priority of the Social Infrastructure Group of Toshiba Corporation, which has been working on development, design, manufacturing, construction, and services for various aspects of social infrastructure. Based on this philosophy, the mission of our group is to supply infrastructure systems, equipment, and solutions that assure peace of mind in society. We are focusing our development activities to realize this mission.

Development of Next-Generation Reactors Based on Advanced Safety Design Approach

SHIMIZU Takeo / SHIOIRI Akio / OIKAWA Hirohide

The concepts of next-generation reactors featuring an in-depth hybrid safety system have been developed. The safety system consists of independent active and passive safety systems. Since the core and containment cooling can be achieved by natural driving force alone under a postulated accident condition, the possibility of radioactive release to the environment is practically excluded.

Thermal Steam Turbine and Turbogenerator Technologies for Reliable Power Supply

IITO Hiromichi / OKITA Nobuo / MIYAIKE Kiyoshi

The power supply business has recently been encountering rapid and dramatic changes involving complicated challenges, such as global environmental concerns, diversification of available fuels, and deregulation of the power supply market. Based on its extensive experience and integrated technological capabilities, Toshiba is developing and manufacturing proven state-of-the-art steam turbines and turbogenerators offering high reliability, high efficiency, compact design, and appropriate services, which satisfy the needs of society for stable electricity supply and the solution to various challenges.

System Technologies Supporting Security and Safety of Social Infrastructure

SHINOHARA Tetsuya / NAGAOKA Norio

With the technological progress of recent years, social infrastructure systems that support urban life require higher levels of processing and greater reliability. In response to these needs, Toshiba is advancing the development of various system technologies and the establishment of business activities in fields such as water purification and sewage disposal, roads, airports, and communications.

In the field of water purification and sewage disposal systems, we have developed system technologies that actualize high-level water quality processing and optimum water content control, and established a business for the consistent operation and maintenance of facilities. In the field of road and airport systems, we have conducted research and development of advanced technologies that support the safety of road traffic and aircraft operations. On the basis of these system technologies, we are continuously contributing to the construction of social infrastructure systems that offer higher levels of security and safety.

Hands-Free Next-Generation Physical Security Systems Using Face Recognition Technology

ISHIBASHI Yuichiro / YAMAGUCHI Osamu / SUKEGAWA Hiroshi

Biometric recognition has recently been adopted for cellular phones and bank automated teller machines. Face recognition, a useful means of maintaining security that is also easy to operate, is regarded as a promising personal recognition technology in the area of biometrics.

Toshiba has been an innovator of original face recognition systems, and installed them as products in access control systems. We have successfully disseminated these systems in the physical security field.

TX1 XML Database Realizing High-Speed Searches in Large-Scale Environments

TANIGAWA Hitoshi / HATTORI Masakazu / MATSUI Koji / SATO Minoru

With "XMLization," or the expression of electronic documents in Extensible Markup Language (XML), becoming more common, requirements for the efficient storage, searching, management, and processing of such XMLized documents are increasing in line with their importance as functions of IT solutions.

Toshiba and Toshiba Solutions Corp. have developed a native XML database software called TX1, which can search large-scale databases at high speed to realize practical new solutions.

Latest Medical Imaging Systems Supporting People's Health

HASHIMOTO Keisuke / WATANABE Naofumi / KANAZAWA Hitoshi

Lifestyle diseases such as cancer and cardiac disease are leading causes of death and their incidence is increasing. Even if one suffers from such a disease, however, a high quality of life can be maintained by early detection and treatment of the condition. Medical imaging systems are extremely useful for early detection of disease. Three-dimensional images generated by medical imaging systems are utilized for decision making and procedure simulation in treatment as well as informed consent by patients and their family members, providing a better understanding of disease. Medical imaging systems thus support people's health in a variety of settings.

Elevators and Escalators Providing Dependability, Safety, and Comfort

KINOSHITA Toru / KOBAYASHI Kiyoshi

Approximately 150 years have passed since the first modern elevator was installed for practical use, and the presence of elevators and escalators is becoming increasingly significant due to the spread of both high-rise buildings and the welfare society. Under these circumstances, Toshiba Elevator and Building Systems Corp. has continued its development activities aiming at the realization of impressive elevators and escalators that offer a comfortable ride. We have been actively introducing the latest technologies in the development process to match the requirements of the times, and embodying them in our products.

For the future, we are committed to the development of elevators and escalators that respond to diversified user needs while offering greater convenience, safety, and comfort.

WILLPOS™ Self-Self-Checkout POS System

UCHIYAMA Masami / MASUI Ryuichiro

Twenty years have passed since the point of sales (POS) real-time sales management system was introduced in Japan, and checkout counters at stores equipped with POS systems are now a familiar sight. However, the role of POS systems has been gradually changing in the context of major shifts in the surrounding environment due to the introduction of the consumption tax and the overall slowdown in spending caused by the economic recession. Nowadays, "value creation type stores" are attracting attention, in which consumers seek to create new value in their lives when they visit a store. This trend makes a clear contrast with the uncertain future of conventional large supermarkets. As the "face" of a store, the POS system is expected to have the latest functions to cope with the changes of the times from the standpoints of consumers, stores, checkout clerks, management, and the information technology environment.

In response to these requirements, Toshiba TEC Corp. has developed and commercialized WILLPOS™ Self, a self-checkout POS system for the Japanese market based on the concepts of compactness, low cost, and barrier-free design.

Products Creating Comfort

Comfortable Living Orchestrated by Electronics in Daily Life

OKAZAKI Shizuo

At the dawn of the 21st century, Japan is becoming a country with an aging population and a low birthrate. Major environmental issues such as global warming have also emerged on a worldwide scale.

With the product development philosophy of "SIMPLE & COMFORT," Toshiba is promoting the development of environmentally friendly home appliances to enhance the happiness and comfort of users. As comfort-oriented initiatives for a networked society, we are also promoting the construction of integrated home networks and the proposal of new business models.

GR-W41FA "NANO HIKARI PLASMA Deodorization SENZOHO" Refrigerator

NII Kunio / TSUKAMOTO Keizo / OKADA Daishin

Toshiba developed and sold Japan's first domestically manufactured electric refrigerator in 1930, making 2005 the 75th anniversary of this achievement. Since that time we have introduced a succession of new refrigerator technologies, such as the "KATTENIKOORI" model incorporating an automatic ice maker prior to other companies.

In this 75th anniversary year we have developed the "NANO HIKARI PLASMA (nano-optical plasma) Deodorization SENZOHO" refrigerator, model GR-W41FA. This new model has been launched in response to consumers' needs including changes in living environments, diversification of diets, and improvement of food distribution to the market.

Latest Washing Machine Technology Embodied in TW-130VB "The Front-in Drum" Model

IMAI Masahiro / SHIGA Tsuyoshi / KANDA Hiroki

Toshiba has developed washing machines with the most advanced technologies in response to customer needs since its introduction of Japan's first domestically manufactured model in 1930. The requirements of users have changed over the years, from an emphasis on the reduction of work to high quality such as improved finish of clothes, low-noise operation, and energy saving.

To meet these requirements, we have released a drum type washer-dryer called "The Front-in Drum," model TW-130VB. This model, launched to commemorate the 75th anniversary of the first washing machine, features a newly developed super direct drive (S-DD) engine.

DAISEIKAI EDR Series Next-Generation Home Air Conditioners with Soft Air Current

HIGASHIJI Hiroaki / SENDOU Kaname

Since its commercialization of the world's first inverter-type air conditioner, Toshiba has played a leading role as a pioneer in energy-saving air-conditioning technologies. Demand has arisen among consumers in recent years for soft air conditioners that not only save energy, but are comfortable, healthy, and clean as well. We have introduced the new DAISEIKAI EDR series of air conditioners to meet this need.

For comfort, a newly developed airflow control system moderates the sharpness of cool airflow onto the skin, which may be a point of concern for women and infants. This system, called the "3D action panel," realizes the optimal airflow in the living space by controlling the front-panel opening angle. For health, a "good-sleep system" is incorporated to constantly maintain the ideal room atmosphere for sound sleep by taking biorhythms into consideration, ensuring that users do not become chilled or sweat while asleep. In the area of cleanliness, a "bacteria-eliminating plasma air purifier" catches and eliminates airborne bacteria, to supply the living space with clean and safe air.

Electronic Ballast Technologies for Comfortable Lighting Environment and Energy Saving

KAKITANI Tsutomu / KITAMURA Noriyuki

In 1978, Toshiba introduced the first electronic ballasts for 40 W tubular fluorescent lamps. Electronic ballasts have improved lighting performance while reducing the size, weight, and power consumption of lighting equipment. Nowadays, electronic ballasts have become indispensable components for energy saving, and will contribute toward reduction of the global environmental burden.

Furthermore, users require not only energy saving but also a comfortable lighting environment. To meet these needs, we have developed new electronic ballasts for fluorescent lamps that have dimming or initial illuminance control functions with the use of a newly invented inverter control IC.

Toshiba Medical Consumer Appliances Realizing Various Integrated Services

SAITO Takeshi / ISSHIKI Masao / KUNUGIDA Kenichi / FUJIBAYASHI Toshihiro

Information, communication, broadcasting, and audiovisual (AV) functions will become integrated in the digital home environment. Various types of services have been launched for digital home networks.

Toshiba is a leader in the field of networked appliances and home AV-PC. The "FEMINITY™" series, the world's first wireless networked household appliances, networked AV appliances, and home AV-PC. We have contributed to the standards for various types of home networks. The need for integration of these home networks will increase from now on, with the gateway serving as the key technology.

Life Support Robots That Coexist in Harmony with People

MATSUHIRA Nobuto / OGAWA Hideki / YOSHIMI Takashi

Robots are expected to be applied to the daily life environment in the future due to such factors as the aging of society. Although some robots have already been developed, work on practical robots for this field has only recently begun. The daily life environment presents many problems, because the environments for both work and recognition functions vary with each situation. For the first step, a robot with omnidirectional auditory function and a robot with stereo vision that accompanies a person have been developed as human interface technologies. Future robots will serve as the core of the home network.

Development Spirit Based on 130 Years of Evolutionary Tradition

Mechanism of "Man-nen dokei," a Historic Perpetual Chronometer

KUBOTA Yuji

The "man-nen dokei," that literally means a clock that works for ten of thousands of years, is a historic perpetual chronometer that was built in 1851 by Hisashige Tanaka (1799-1881), who founded the predecessor of Toshiba Corporation. One of the most original symbols of Japanese manufacture, it has six multifunctional clock faces and is crowned with a celestial globe that shows the positions of the sun and the moon. It runs almost a year with only a single winding.

Toshiba has conducted an investigation on the mechanism of the "man-nen dokei" and has developed a simulator for its mechanism in cooperation with a national project to disassemble, restore, and reproduce this clock. The "man-nen dokei" is an embodiment of

Tanaka's engineering spirit: insatiable curiosity and a ceaseless quest for innovation.

Electromagnetically Induced Transparency in Solids--Principle of Devices of Tomorrow

ICHIMURA Kouichi

Electromagnetically induced transparency (EIT) is a phenomenon in which the optical properties of a material, such as absorption and emission, are dramatically modified as a result of the generation of the superposition states of the material when irradiated by two lights.

Toshiba has realized EIT, which had formerly been observed only in gases, in a solid medium by using rare-earth ions in a crystal (Pr³⁺:Y₂SiO₅). We have also proposed the application of EIT in solids to quantum computers, because the lifetime of the superposition states in the crystal is extremely long and the superposition states can be controlled by lights. EIT in solids has recently begun to be studied by other research institutes, and is growing as a novel technology.