

TOSHIBA REVIEW

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Special Reports

CELL REGZATM—The Innovative LCD TV

CELL REGZATM Realizing All Future Possibilities of TV

TOKUMITSU Shigenori

Trends in High-Performance and Multifunction Flat-Panel TV Technologies and CELL REGZATM

TAKAKU Kazumitsu

With the wide dissemination of digital high-definition (HD) broadcasting in recent years, flat-panel TVs including those equipped with a liquid crystal display (LCD) have become more common. To overcome competitors and survive in the market, it is necessary to implement outstanding evolution by developing products with high performance and functionality in addition to basic functions such as reception of digital HD broadcasts.

Toshiba has developed the REGZATM LCD TV series of high-performance multifunctional TVs featuring high-level picture quality powered by an image-processing engine, as well as network and hard disk drive (HDD) recording functions. The CELL REGZA, released in December 2009 as the flagship HDTV of the REGZA lineup, reaches the highest state of development of high-performance multifunctional TVs due to the incorporation of the Cell Broadband EngineTM high-performance multicore processor, which makes it possible to not only refine the performance but also acquire new functions by means of software updates.

CELL PlatformTM Expanding Limits of TV Performance

MORI Masanori / NISHIDA Yoshihiro / DONIWA Kenichi

Toshiba has developed the CELL Platform, which serves as the heart of the CELL REGZATM flagship high-definition (HD) TV

of the REGZATM lineup. Incorporating the Cell Broadband EngineTM (abbreviated as Cell BE) high-performance multicore processor, the CELL Platform supports innovative high resolution as well as high sound quality, recording technology, and network technology. It is composed of three boards: a Cell BE board consisting of the Cell BE, interface large-scale integrations (LSIs), and main memories; an HDTV function board; and a light-emitting diode (LED) backlight control board. The combination of the CELL Platform with 13 digital tuner units and 3 Tbyte hard disk drive (HDD) units makes it possible to offer viewers new value, including remarkably high picture and sound quality, multichannel HDTV viewing and recording, and networking functions.

"Mega LED PanelTM" Reproducing Jet Black and Sparkling White on CELL REGZATM

BABA Masahiro / OBAYASHI Toshio / TSUCHIYA Ryuji

Demand has been growing in recent years for liquid crystal display (LCD) TVs that can reproduce high-definition (HD) digital images of higher quality.

With this as a background, Toshiba has developed the Mega LED Panel featuring a light-emitting diode (LED) backlight with local dimming technology, and introduced it into the CELL REGZA, the flagship HDTV of the REGZATM lineup. The CELL

REGZA with the Mega LED Panel achieves a peak luminance of 1,250 cd/m², which is 2.5 times brighter than conventional LCD-TVs, and a dynamic contrast ratio of 5,000,000:1. The CELL REGZA offers viewers state-of-the-art picture quality with jet black and sparkling white color reproduction.

Advanced Super-Resolution Technologies of CELL REGZATM

MISHIMA Nao / YAMAUCHI Himio

The image resolution of DVD contents and online contents distributed via the Internet is often lower than that of full-high-definition (HD) contents (1,920 x 1,080 pixels). To overcome the poor quality of image edge details using conventional technologies based on linear upscaling, Toshiba has developed a super-resolution technology that achieves high-quality HD images and released the REGZATM series of HD televisions (HDTVs) incorporating this technology.

We have also developed the CELL REGZA, the flagship HDTV of the REGZA lineup, which offers images superior to those provided by existing HDTVs through the following advanced super-resolution technologies installed on the high-performance CELL PLATFORMTM: (1) super-resolution technology for Internet video, (2) super-resolution technology using self-congruency, and (3) super-resolution technology for color components.

"Time-Shift MachineTM" Allowing Recorded Programs to be Shown like Real-Time Broadcasting

YOSHIDA Osamu

The CELL REGZATM, released in December 2009 as the flagship high-definition (HD) TV of the REGZATM lineup, features unprecedentedly high resolution and high sound quality, unprecedented recording functionality, and unprecedented network capability.

With regard to the recording functionality, the "time-shift machine" is a key function that allows up to approximately 26 hours of programming to be simultaneously recorded from up to eight digital terrestrial broadcast channels. The time-shift machine offers viewers a new audiovisual experience, transforming the mere receiving of previous programs into the new discovery of programs.

High-Performance Audio Technology of CELL REGZATM

KUWABARA Mitsutaka / TAKEUCHI Hirokazu

As the flagship high-definition (HD) TV of the REGZATM lineup, the CELL REGZA is aimed at realizing not only high performance but also the highest quality from every point of view, including image quality, design, and functionality. However, it was difficult to achieve high-quality sound due to the dimensional restrictions in the development of flat-panel HDTVs.

To rectify this situation, Toshiba has developed an audio system with a new innovative concept giving highest priority to the sound quality. Almost the same level of sound quality as in a high-grade audio system is realized by a newly developed speaker system and multichannel digital amplifier. Moreover, the CELL PlatformTM at the heart of the CELL REGZA system incorporates a content-based adaptive audio enhancement control function that provides real-time sound processing suitable for movie scenes.

"Roaming NaviTM" Content-Centric User Interface

YAMAUCHI Yasunobu / SUZUKI Masaru / AJITOMI Daisuke

Users are increasingly demanding a means of performing effective searches for media contents of interest to them from among the enormous volume of broadcast and Internet contents available, instead of the conventional list-based type of graphical user interface.

In response to this need, Toshiba has developed Roaming Navi, a relevance-driven content search system utilizing a content-centric user interface based on relationships among media contents to access or find new media contents of interest to the user. Relevant contents are displayed on the screen according to the relevance information, with the distance and direction of the relevant content from the center content indicating the strength and attribute of the relevance, respectively. We have also developed a feasible relevance calculation scheme based on user evaluation tests, and confirmed its effectiveness.

Stroke Recognition Technology for Touchpad on CELL REGZATM Remote Controller

TONOUCHI Yojiro / ASANO Mieko / OHIRA Hidetaka

Toshiba has developed a novel stroke recognition technology for the CELL REGZA remote controller, which is equipped with a touchpad. This stroke recognition technology incorporates two recognition techniques: one for recognizing handwritten characters, and the other for recognizing gestures from strokes made by the trajectories of the user's finger on the touchpad. This technology allows the CELL REGZA to offer an easy and intuitive means of controlling TV functions such as pointer control for Internet browsing and character input for TV program search, which users often find troublesome when they use a conventional remote control with push buttons.

Software of CELL REGZATM

KATO Nobuhiro / AMEMIYA Jiro

The CELL REGZA, Toshiba's leading-edge LCD TV, incorporates the Cell Broadband EngineTM (abbreviated as Cell BE) high-performance multicore processor and offers new features that have never been realized by conventional TV sets. To realize key features including multiple display, electronic program guide (EPG) with moving pictures, and high-speed channel tuning, the software structure of the CELL REGZA is dynamically changed by making effective use of its computing power and memory. The CELL REGZA also has the capability to acquire new functions by software updates.

Improvement of GUI Development Environment for CELL REGZATM

TAKAYAMA Yoshifumi / KOMAKI Akinori / HIRANO Yutaka

Sophisticated, user-friendly graphical user interfaces (GUIs) are required to enjoy the high performance of the CELL REGZA, the flagship high-definition (HD) TV of the REGZATM lineup.

In order to improve the efficiency of GUI development for the CELL REGZA, Toshiba has established an appropriate environment for GUI development comprising an automated GUI design converter that can automatically convert GUI designs into GUI resource data, a unified GUI framework that offers an application program interface (API) for event handling and animation, and a memory leak checker library as well as customizable test tools that make a significant contribution in the testing phase. These features have been shown to be effective in improving the GUI development environment for the CELL REGZA.

Feature Articles

Enhanced Versatility Technologies Supporting ToSpeakTM V2 Next-Generation Text-to-Speech System

HIRABAYASHI Go / MIZUTANI Nobuaki / KAGOSHIMA Takehiko

Voice guidance is becoming increasingly prevalent in daily life, particularly in contexts such as information terminals in public facilities, automatic responses by call centers, and "talking" home appliances. As text-to-speech (TTS) technology enables users to generate arbitrary voices simply by inputting text, it can not only significantly reduce the cost and time required for creating voice contents, but also assist in the wide dissemination of voice services.

Toshiba has developed ToSpeakTM V2, a new TTS system that can synthesize various voices and speaking styles with high-quality, natural sound for new fields of application.

Transmit Beamforming Technology for High-Speed Wireless LAN

NABETANI Toshihisa / EGASHIRA Yoshimasa / TAKEDA Daisuke

The quality of wireless communications varies with the time and place due to channel fluctuations caused by the presence of obstacles and people. Improvement and stabilization of communication quality are therefore critical issues for wireless communications, particularly for high-speed wireless LAN complying with the Institute of Electrical and Electronics Engineers (IEEE) 802.11n standard.

Toshiba has developed a transmit beamforming technology for high-speed wireless LAN to improve communication quality using digital signal processing according to the state of the wireless channels. This technology makes it possible to realize wireless communication systems with communication robustness, higher transmission rates, and an extended communication range.

Optical Simulation Technology for Wafer Defect Inspection Systems

FUJII Takayoshi / YOSHINO Kiminori

With the recent advancements in miniaturization of semiconductor device design rules, there is growing demand for optical inspection systems that can detect smaller defects of interest (DOI) in semiconductor devices. The performance of inspection systems has been improved by the introduction of complex optical conditions in illumination and collection systems, including the use of shorter wavelengths and polarization filters. However, a great deal of effort is required to adjust the optical conditions to the optimal levels.

In order to overcome these problems, Toshiba has developed a simulation technology to estimate the magnitude of defect signals for given optical conditions of an inspection system. This simulation makes it possible to shorten the period of product development by preparing candidate optical conditions without the risk of signal reduction caused by variations in the process before trial production.

QosmioTM V65/F60 High-Mobility AV Notebook PC

SAKAI Akio / ITAKURA Hiroaki / SATO Shigenobu

Toshiba has developed the Qosmio series of audiovisual (AV) notebook PCs, which successfully balance the functionality of a notebook PC and that of digital AV equipment. In recent years, demand has been growing for AV notebook PCs that are sufficiently thin and light to be easily carried.

To meet the demand for enhanced mobility, we have released the Qosmio V65/F60, the sixth-generation AV notebook PC, incorporating the SpursEngineTM high-performance stream processor, a Blu-ray Disc drive, and a digital terrestrial TV tuner for high-speed processing of high-definition (HD) contents, with a reduction in thickness achieved by the use of high-density mounting technology cultivated in the development of our mobile notebook PCs. Moreover, the Qosmio V65/F60 offers improved durability and increased depth of color by a new decoration technique using in-mold forming (IMF).

Adapter Technology for Connecting nv Series Unified Controller to Various Networks

FUKAI Eigo / SHIBATA Koji / MOURI Fumitaka

Industrial controllers are key components of control systems used in various fields including general industrial infrastructure, social infrastructure, and electric power plants.

Toshiba released the nv series unified controller, an advanced industrial controller featuring high-speed processing, highly reliable functions, and fast transmission to equipment in the field, in 2007. In response to the demand for interconnection between the nv series unified controller and equipment in the field via several types of networks, we have developed an adapter technology based on the TC-netTM I/O Loop international standard, and realized a station adapter corresponding to various networks in the global market.

Optimal Turbine Startup Methodology Based on Thermal Stress Prediction

MATSUMOTO Shigeru / YAKUSHI Koji / KITAGUCHI Noriaki

Shortening of the startup time of a steam turbine generator contributes not only to increased flexibility with respect to demand from the electricity grid, but also to reductions in the environmental burden and fuel costs. However, it is necessary for the turbine to operate under a proper startup schedule in order to control the rotor thermal stress to within the designed limit. Toshiba has developed a control methodology that can shorten the startup time by continuously monitoring the operating conditions, predicting future thermal stress, and performing real-time correction of the startup schedule so that the thermal stress is controlled to just below the limit.

Spectral Power Distributions with Color Appearance of LED Light Sources

KOTANI Tomoko

White light-emitting diode (LED) lamps composed of a blue LED and yellow-emitting phosphor are widely used as illumination light sources due to their high efficiency and broad beam of light. However, this type of LED lamp is characterized by insufficient color-rendering performance, particularly the loss of red quality caused by the lack of long-wavelength radiation.

To clarify the ideal spectral power distribution of white LED lamps in order to improve their color appearance, Toshiba Lighting & Technology Corporation fabricated a prototype based on theoretical simulations in which red, green, and blue LEDs were combined with a white LED comprising a blue LED and yellow-emitting phosphor. From the results of subjective evaluation experiments, we confirmed that white LED light sources with more comfortable lighting effects can be realized by adding appropriate spectral power distribution to the red, green, and blue regions of existing white LED lamps.

Frontiers of Research & Development

High-Accuracy Human Detection Technology Using Novel Feature Descriptor