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Special Reports

Advanced Technologies for Digital Media Processing

Digital Media Supporting the Information Technology Society
MORI Kenichi

Recent Advances and New Applications of Computer Vision
Roberto Cipolla / Carlos Hernandez / George Vogiatzis / Bjorn Stenger
(468KB / PDF)

Trends in Advanced Digital Media Processing in Familiar Digital Devices
YAMAUCHI Yasunobu / DOI Miwako
The performance of digital media devices such as PCs, TVs, and mobile phones has rapidly progressed in recent years, and people now depend on these devices for convenience and comfort in life. However, the increasing volume of Internet data, which can now be easily acquired via a broadband network, also creates problems for users in terms of accessing the data that they actually need.
Although people's ability to handle large volumes of media data can be augmented by means of digital devices, it is difficult for users to access most of the data they need due to the gap between the capabilities of human users and digital devices. Human-friendly digital media processing is required to compensate for this gap.
Toshiba has created various advanced media processing methods and digital devices focusing on high-quality media representation that appeals to people's sensibilities, natural and intuitive human-machine interaction, and data filtering using relational information.

High-Dimensional Texture Technology for Photorealistic Computer Graphics
SEKINE Masahiro /MIHARA Isao / YAMAUCHI Yasunobu
If high-quality computer graphics (CG) offering photorealistic surface appearances can be created, they can be applied in a broad range of markets including not only motion pictures and video games but also industrial product design and e-commerce. Complex CG modeling and complex shading calculations have conventionally been necessary for rendering photorealistic CG.
Toshiba has developed a high-dimensional texture technology that can create CG with a photorealistic surface appearance by using images of the material captured under various conditions. In addition, the high-quality CG can be controlled interactively using a graphics processing unit (GPU).

Interactive Vector Rendering for 3D User Interfaces
KOKOJIMA Yoshiyuki / SUGITA Kaoru
Toshiba has developed a new method for graphics processing unit (GPU)-accelerated rendering of vector graphics such as Flash and TrueType characters embedded in a three-dimensional space. Our method requires no expensive preprocesses, allowing it to render dynamically deformable vector objects with high efficiency.
We have implemented a prototype 3D electronic program guide (EPG) browser using this method. This browser provides an easy way for users to select their favorite TV contents from among a large number of videos stored on hard disk.

High-Compression PDF Conversion Technology
DOBASHI Toshimasa / MIZUTANI Hiroyuki
In order to meet the growing demand for efficient document image compression, Toshiba Solutions Corporation has developed a high-compression PDF conversion technology suitable for color document images obtained by scanners, multifunctional peripherals (MFDs), and so on. This highcompression PDF conversion technology realizes smaller file size and better image quality compared with JPEG technology by separating character elements and non-character elements in the document and adopting the appropriate compression method for each element.

ToSpeak™ High-Quality Text-to-Speech System
KAGOSHIMA Takehiko
Toshiba has developed ToSpeak™, a new text-to-speech (TTS) system that synthesizes speech in a high-quality, natural manner. ToSpeak™ can generate synthesized speech having the individuality of an original speaker in terms of prosody and voice quality from any input text. This TTS system features corpus-based approaches including (1) statistical training of prosody control rules, and (2) a plural unit selection and fusion method for the speech waveform generation module (synthesizer). In the prosody training, representative fundamental frequency vectors are extracted
from the speech corpus so as to minimize errors of the resultant fundamental frequency contours. In the synthesizer, the proposed method achieves stable, humanlike speech quality. Our TTS systems are used in a variety of applications such as the speech interface of car navigation systems.

Face Recognition Technology for Identification of Walking Person
YAMAGUCHI Osamu / NISHIYAMA Masashi / KAWAHARA Tomokazu
Face recognition technology is widely utilized for various media processing purposes. Toshiba has continued to improve the performance of this technology in the field of security applications. An advantage of face recognition in the security field is its higher user-friendliness compared with other biometric techniques.
In order to further enhance convenience, we have developed the SmartConcierge™ walkthrough type face recognition system that can identify a walking person. Moreover, we are also developing an advanced face recognition system for the simultaneous identification of multiple walking people.

Online Overlapping Handwriting Recognition -New Character Input Interface for Mobile Phones
TONOUCHI Yojiro / KAWAMURA Akinori
In conventional Japanese online handwriting recognition systems, it is common to employ a multi-box writing interface where the user writes a character in each box in succession. The handwriting in a box is recognized as a character after the stylus moves to the next box. However, the size of the individual boxes is small because of the limited area available for writing in small devices. It is uncomfortable for users to write small characters in small boxes, particularly when writing by finger.
Toshiba has developed a novel online overlapping handwriting recognition system for mobile devices such as cellular phones. It is suitable for small devices, because the user can input characters continuously without pauses in a single writing area. It also has two other features: (1) quick response from handwriting input to display of the recognition result, and (2) users can input characters without having to watch their hands. In addition, it enables users to not only input characters but also to perform basic operations directly by inputting handwritten gestures. These features provide mobile users with a comfortable character inputting system.

Omnidirectional Acoustic Sense Technology for Voice Differentiation
SUZUKI Kaoru / KOGA Toshiyuki
Toshiba has developed a new omnidirectional acoustic sense technology to facilitate natural interactions between humans and robots. We used the Hough transform to detect straight lines from the frequency phase difference space for the detection and localization of sound sources. An ApriAlpha™ robot equipped with this function could localize and recognize multiple speakers from unlimited different directions and reply to each speaker.

Home Security Robot Using Life Ontologies and Blog Interface
CHO Kenta / KAWAMURA Takahiro
Toshiba has been developing a home security robot using the ApriAlpha™ home robot to integrate legacy appliances in a home. This system provides a blog interface to receive users' requests remotely in natural-language sentences and show the status of appliances via a Web browser. The robot serves as an" intelligent glue" that connects and automates the legacy appliances, allowing the users to easily introduce an intelligent environment in their home. It uses ontologies about commodities in the home, locations where these are placed, and tasks the robot can achieve. By using these ontologies, the robot can select and combine appropriate actions to respond to a wide variety of user requests.

"SASATTO Search" Human Interface Technology for Information Retrieval
SUZUKI Masaru / ISHITANI Yasuto / SAKAMOTO Kei
To realize easy and accurate information retrieval, Toshiba has developed a pen/mouse-based human interface called "SASATTO Search" for chaining searches of the Web search system. If a user selects a keyword from a document that he/she is reading, documents related to the keyword can be obtained simply by selecting the desired search method from a display context menu. It is easy to accomplish such a search because the meaning of the keyword is determined by semantic pattern analysis and the menu contains search methods suitable for the meaning. In an experiment involving 15 users, it was confirmed that the proposed interface is more effective in terms of easier and more accurate information retrieval compared with the conventional method.

HOTWORDLINK™ for Topical Word Extraction and Related Information Retrieval
OKAMOTO Masayuki / FUJINO Go / NEGISHI Shinichi
Technologies for extracting and visualizing topical news are a current trend in Web services. Toshiba has developed HOTWORDLINK™, a topic-extraction function for audiovisual-specialized notebook PCs. HOTWORDLINK™ visualizes topical news items and their trends and enables the easy retrieval of related Web pages with one click. The features of HOTWORDLINK™ include topic extraction with two-level clustering and statistical techniques, the classification of each topic into positive or negative, and person-name extraction. The results of experiments showed that the extracted topics and trend graphs contributed to the subjects' understanding.

Commutents™ Communication Support System via Blog and Video Contents
TSUTSUI Hideki / YAMASAKI Tomohiro / URATA Koji
Toshiba has developed Commutents™, a communication support system enabling exchanges of comments about video contents. In this system, comments about scenes on DVDs are shared via a blog system. This makes it possible for users to share only comments without sharing the contents themselves, by identifying DVDs that the users individually own.
This system has two display modes: a video synchronous display mode with gathered comments, allowing users to find blog articles that they are interested in; and a blog display mode, which is suitable for the reading of articles. By cooperatively using these two display modes, users are appropriately led to blog articles. The effectiveness of this system was confirmed by an evaluation test.

Digital Media Processing Technologies for Healthcare Solutions
OSADA Masakazu
Information technology(IT) has gained a solid position in healthcare institutions in Japan as a means of reducing costs and increasing efficiency while maintaining the quality of healthcare services.
Toshiba Medical Systems Corporation has developed several innovative healthcare IT solutions such as the Rapideye™ picture archiving and communication system(PACS), the RapideyeTM hyperlink reporting system, and a teleradiology solution by applying the digital media processing technologies of the Toshiba Group.

Feature Articles

Device Synchronization among TV, DVD, and Notebook PC Using HDMI-CEC
OHKITA Hideki / MIYAZAWA Akira / MARUYAMA Koji / TAKENOUCHI Hiroki
After having developed technologies for cooperative operation of digital devices such as Digital Living Network Alliance (DLNA)-certified devices, Toshiba has now launched digital products in which high-definition multimedia interface-consumer electronics control (HDMI-CEC) technology is implemented. HDMI-CEC technology makes it possible to operate TV and other digital equipment as part of the REGZA LINK environment. It offers TV-remote operation of digital equipment connected with the TV via HDMI such as an HD DVD player/recorder and an audiovisual (AV) notebook PC, permitting easy integrated operation using the remote control as if the TV has all of the functions of the connected devices.
We have released the world's first notebook PC incorporating HDMI-CEC and realized interoperation between TV and PC using this technology.
We will continue to lead innovation in digital products using interoperation technologies.

Information Coalition Platform to Realize Design for Manufacturability in SoC Production
KAKINUMA Hidenori / MORINAGA Hiroyuki
In the system-on-chip (SoC) market, which is characterized by a high product mix and low-volume manufacturing, refining a design or a photo mask can be a fatal action in terms of time to market. Design for manufacturability (DFM), which defines the methodology for considering the manufacturing yield at the design stage, is therefore becoming increasingly important. In order to maximize the efficiency of DFM, collaboration between design and manufacturing is necessary. However, differences in the locations, environments, and information technology (IT) systems of the design and manufacturing processes have been causing huge losses in information exchange.
In response to this situation, Toshiba has developed an IT-based platform to realize effective information coalition between design and manufacturing, and integrated the system into actual SoC production.

Manganovel.com International Manga Distribution Network with User Translation
KUNIMATSU Atsushi
Manganovel.com is the first manga (comic) distribution system via the World Wide Web network utilizing a user translation method. Japanese manga have recently been gaining popularity in Western countries following the dissemination of Japanese anime (animated cartoons) and video games, and are expected to become a lucrative market in the near future as deployed by Japan's contents policies. However, although anime andvideo games are often based on manga, the genre of manga itself has not yet secured a footing in the world. Various obstacles have been hindering the global dissemination of manga, such as vernacular book distribution systems, translation costs, and currency exchange.
Manganovel.com employs a client-server application via a computer network, thereby bypassing the distribution problem, while the user translation method provides a unique solution to translation costs and a prepaid points system in Japanese yen overcomes currency exchange issues.
Manganovel.com thus enables users throughout the world to enjoy manga with ease.

Frontiers of Research & Development

Dynamically Reconfi gurable Hardware Engine for Image Processing
Challenging the Ultimate Frontiers of Electron Spectroscopy