The IEEE Computer Society offers a lineup of 13 peer-reviewed technical magazines that cover cutting-edge topics in computing including scientific applications, design and test, security, Internet computing, machine intelligence, digital graphics, and computer history. Select articles from recent issues of Computer Society magazines are highlighted below.

Architectures come about through forces and needs other than those captured in traditional requirements documents. A business goal expresses why a system is being developed and what stakeholders in the developing organization, the customer organization, and beyond aspire to achieve through its production and use. Business goals can provide the rationale for requirements and help identify missing or superfluous requirements; they can also influence architectures directly, even without affecting requirements at all.

A business goals viewpoint can help capture precise, unambiguous business goals, which in turn helps architects design systems that are more responsive to organizational needs. In the November/December issue of IEEE Software, Paul Clements and Len Bass of the Software Engineering Institute coauthor “The Business Goals Viewpoint.”

Dramatic advances have been made in intelligent systems from 1980 to today. The Web has created an environment in which some of the basic problems identified in the 1970s are emerging in new, often more concrete and practical, forms. Correspondingly, the opportunities for space exploration to benefit from intelligent systems are evolving in unexpected directions, but with certain invariants regarding knowledge representation and process modeling.

Researchers Michael G. Shafto of NASA Ames Research Center and Maarten Sierhuis of Palo Alto Research Center introduce a September/October special issue on intelligent systems in “AI Space Odyssey.”

“Interoperable Security Standards for Web Services” is part of IT Pro’s September/October special issue on hot topics in cloud computing. Sitaraman Lakshminarayan of GE Energy reviews the WS-Security architecture and related standards in cloud computing environments. Established by the Organization for the Advancement of Structure Information Standards (OASIS), WS-Security addresses confidentiality and integrity issues as well as challenges related to exchanging security tokens such as usernames and passwords. The article suggests ways of integrating standards to create a flexible Web services security architecture.

The 2010 IEEE Symposium on 3D User Interfaces sponsored the first 3DUI Grand Prize, a contest for innovative, practical solutions to classic 3DUI problems. In the November/December issue of CG&A, “3DUI 2010 Contest Grand Prize Winners” describes the rationale for the first contest and gives an analysis of all submissions. Each category’s winners also discuss their solutions.

High-performance computing facilities in the US consume enormous amounts of electricity, cutting into research budgets and challenging efforts to reduce energy consumption and meet environmental goals. Facility designs that target efficiency greatly reduce energy demand.
“Money for Research, Not Energy Bills: Finding Energy and Cost Savings in High-Performance Computer Facility Designs,” by Dale Sartor of Lawrence Berkeley National Laboratory and Mark Wilson of Drewmark Communications, is a case study that describes strategies and technologies to achieve facility energy reductions through thoughtful design. Read this article and many others on green high-performance computing in the November/December issue of CISE.

As part of a September/October special issue on reliable and embedded systems, S&P’s guest editors engaged in a roundtable discussion on topics that other theme articles didn’t address. MITRE’s Sean Barnum, UC Berkeley’s Shankar Sastry, and the University of Virginia’s John A. Stankovic discuss myriad topics in “Roundtable: Reliability of Embedded and Cyber-Physical Systems.”

Research in eye-based human-computer interaction has increased over the past 20 years. Current HCI research mostly focuses on stationary eye trackers and settings as well as single-modal interaction. “Toward Mobile Eye-Based Human-Computer Interaction,” in the October-December issue of PvC, surveys the latest advances in portable eye tracking and automated eye movement analysis, suggesting a new generation of mobile eye-based and multimodal interfaces.

The US Federal Communications Commission’s new long-term vision for broadband deployment, featuring connectivity for every citizen and increasing spectrum allocation for wireless applications and similar technologies, has been delayed and perhaps sidetracked. Why? According to author Stephen Ruth of George Mason University, it is because of the recent Google-Verizon proposal, network-neutrality disputes, uncertainties about the feasibility of a “broadband for everybody” policy, and many other issues. Read “Bumps on the Road to the National Broadband Plan” in the November/December issue of Internet Computing.

At cloud computing scales, even minor performance improvements translate into huge cost savings. In “Google-Wide Profiling: A Continuous Profiling Infrastructure for Data Centers,” a team of Google software engineers describe GWP’s always-on infrastructure for recording event samples and associated information vectors. GWP collects roughly a dozen events, including CPU cycles, retired instructions, L1 and L2 cache misses, and branch mispredictions. The associated vectors contain information such as application and functions names, platform, and build revisions. The Micro article includes example uses of profile queries to improve datacenter applications’ performance.

BilVideo-7 is an MPEG-7-compatible, distributed, video indexing and retrieval system that supports complex multimodal queries in a unified framework. Early prototype multimedia database management systems used the query-by-example paradigm to respond to user queries. The query-by-keyword paradigm, on the other hand, has emerged due to the desire to search multimedia content in terms of semantic concepts using keywords or sentences rather than low-level multimedia descriptors.

A team of researchers from Turkey’s Bilkent University presents its solutions in “BilVideo-7: An MPEG-7- Compatible Video Indexing and Retrieval System,” in the July-September issue of MultiMedia.

D&T’s September-October issue features five articles that describe innovative approaches to issues facing next-generation semiconductors. These include process variations in circuit design, timing analysis in large designs, dynamic task mapping in multiprocessor SoCs, and improved test methods.

The Think Piece in Annals’ July-September issue is a short essay, “Promoting the Prosaic: The Case for Process-Control Computers.” Jonathan Aylen of the University of Manchester focuses on the innovations in process control for low-level automation from the late 1950s to the 1970s. The breakthroughs in civilian process control were essentially products of the Cold War, he writes. But the diverse application priorities sparked the development of real-time processor interrupts and sped the adoption of transistors and visual displays. Aylen argues for their importance in changing the focus of computer development to specific user needs.

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