บทความที่น่าสนใจประจำเดือนตุลาคม 2557

สาขาวิทยาศาสตร์และเทคโนโลยี

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Title:	Cloud gaming: a green solution to massive multiplayer online games
Author:	Seong-Ping Chuah ; Chau Yuen ; Ngai-Man Cheung
Journal:	IEEE Wireless Communications (Volume:21 , Issue: 4) August 2014, pages: 78 - 87
Abstract:	Advanced video gaming is a computationally intensive application. Sophisticated graphics renderings are employed in computer games to produce realistic scenes and smooth actions. As a result, video gaming often requires powerful hardware that is beyond the capability of many mobile devices or even personal computers. Meanwhile, playing a high-quality game while on the move is highly desirable with the growing popularity of high-speed mobile and broadband Internet, and mobile devices such as smartphones and tablets. Instead of equipping mobile devices with powerful but battery-hungry computation engines, cloud gaming, which utilizes cloud computing for gaming, offers an emerging green solution to bring the high-quality immersive gaming experience to thin or mobile clients. Cloud gaming leverages communication infrastructures to shift heavy computation to cloud servers. In this article, we provide an overview of cloud gaming from a green media perspective (in addition to the conventional energy perspective). We argue that cloud gaming can lead to less software maintenance, more economical scaling, and longer service life spans of hardware equipment. We also briefly present a novel scheme, layered coding, which leverages the increasing graphics processing capability of a mobile client to reduce the bit rate of game streaming. We then discuss green designs of major cloud gaming subsystems: a cloud data center, graphics rendering, video compression, and network delivery. We review existing services and a testbed for cloud gaming. We also identify potential research challenges of cloud gaming in achieving green media for the future.
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Title:	Communicating in the real world: 3D MIMO
Author:	Xiang Cheng ; Bo Yu ; Liuqing Yang ; Jianhua Zhang ; Guangyi Liu ; Yong Wu ; Lei Wan
Journal:	IEEE Wireless Communications (Volume:21 , Issue: 4) August 2014, pages: 136 - 144
Abstract:	Spectrum efficiency has long been at the center of mobile communication research, development, and operation. Today it is even more so with the explosive popularity of the mobile Internet, social networks, and smart phones that are more powerful than our desktops used to be not long ago. The discovery of spatial multiplexing via multiple antennas in the mid-1990s has brought new hope to boosting data

		rates regardless of the limited bandwidth. To further realize the potential of spatial multiplexing, the next leap will be accounting for the three-dimensional real world in which electromagnetic waves propagate. In this article we discuss fundamentals and key technical issues in developing and realizing 3D multi-input multi-output technology for next generation mobile communications.
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3	Title:	An efficient method for minimizing energy consumption of user equipment in storage-embedded heterogeneous networks
	Author:	Arai, S. ; Md Fadlullah, Z. ; Ngo, T. ; Nishiyama, H. ; Kato, N.
	Journal:	IEEE Wireless Communications (Volume:21 , Issue: 4) August 2014, pages: 70 - 76
	Abstract:	Recently, the issue of energy consumption of the UEs in heterogeneous networks has rapidly become a research focus area of the entire telecommunications community. This issue is obviously critical because the energy consumption of UEs can severely degrade their already limited battery capacity. In this article, we consider a heterogeneous network environment comprising base stations (each of which is also referred to as an eNB) with embedded storage that can serve as an effective cache-based traffic offloading technology in scenarios where many UEs simultaneously want to access popular contents of sports matches, live music events, and so forth. However, if many UEs are connected to only a few eNBs, they suffer from degraded throughput and increased transmission time. This longer transmission time eventually leads to increased energy consumption of UEs. To deal with this challenge, we propose an algorithm to reassign UEs to eNBs to minimize the total energy consumption of UEs with the constraint that their throughput is guaranteed. The effectiveness of our proposed algorithm is evaluated through computer-based simulations.
	Database:	IEEE/IET Electronic Library (IEL)

4	Title:	Complex-Valued Recurrent Correlation Neural Networks
	Author:	Valle, M.E.
	Journal:	IEEE Transactions on Neural Networks and Learning Systems (Volume:25 , Issue: 9) September 2014, pages: 1600 - 1612
	Abstract:	In this paper, we generalize the bipolar recurrent correlation neural networks (RCNNs) of Chiueh and Goodman for patterns whose components are in the complex unit circle. The novel networks, referred to as complex-valued RCNNs (CV-RCNNs), are characterized by a possible nonlinear function, which is applied on the real part of the scalar product of the current state and the original patterns. We show that the CV-RCNNs always converge to a stationary state. Thus, they have potential application as

	associative memories. In this context, we provide sufficient conditions for the retrieval of a memorized vector. Furthermore, computational experiments concerning the reconstruction of corrupted grayscale images reveal that certain CV-RCNNs exhibit an excellent noise tolerance.
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Title:	The Field of Values of a Matrix and Neural Networks
Author:	Georgiou, G.M.
Journal:	IEEE Transactions on Neural Networks and Learning Systems (Volume:25 , Issue: 9) September 2014, pages: 1613 - 1620
Abstract:	The field of values of a matrix, also known as the numerical range, is introduced in the context of neural networks. Using neural network techniques, an algorithm and a generalization are developed that find eigenpairs of a normal matrix. The dynamics of the algorithm can be observed on the complex plane. Only limited visualization is possible in the case when the matrix is Hermitian (or real symmetric) since the field of values is confined on the real line. The eigenpairs can serve as stored memories, which are recalled by using the algorithm. Shifting in the algorithm is also discussed, which assists in finding other eigenpairs. Trajectories of runs of the algorithm are visually presented, through which the behavior of the algorithms is elucidated.
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Title:	Building a network highway for big data: architecture and challenges
Author:	Xiaomeng Yi ; Fangming Liu ; Jiangchuan Liu ; Hai Jin
Journal:	IEEE Network (Volume:28 , Issue: 4) July-August 2014, pages: 5 - 13
Abstract:	Big data, with their promise to discover valuable insights for better decision making, have recently attracted significant interest from both academia and industry. Voluminous data are generated from a variety of users and devices, and are to be stored and processed in powerful data centers. As such, there is a strong demand for building an unimpeded network infrastructure to gather geologically distributed and rapidly generated data, and move them to data centers for effective knowledge discovery. The express network should also be seamlessly extended to interconnect multiple data centers as well as interconnect the server nodes within a data center. In this article, we take a close look at the unique challenges in building such a network infrastructure for big data. Our study covers each and every segment in this network highway: the access networks that connect data sources, the Internet backbone that bridges them to remote data centers, as well as the dedicated network among data centers and within a data center. We also present two case studies of real-world big data

		applications that are empowered by networking, highlighting interesting and promising future research directions.
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7	Title:	Search in the universe of big networks and data
	Author:	Gelenbe, E. ; Abdelrahman, O.
	Journal:	IEEE Network (Volume:28 , Issue: 4) July-August 2014, pages: 20 - 25
	Abstract:	Searching the Internet for some object characterized by its attributes in the form of data, such as a hotel in a certain city whose price is lower than some amount, is one of our most common activities when we access the web. We discuss this problem in a general setting, and compute the average amount of time and energy it takes to find an object in an infinitely large search space. We consider the use of N search agents that act concurrently in both the case where the search agent knows which way it needs to go to find the object, and the case where the search agent is completely ignorant and may even head away from the object being sought. We show that under mild conditions regarding the randomness of the search and the use of a time-out, the search agent will always find the object in spite of the fact that the search space is infinite. We obtain a formula for the average search time and the average energy expended by N search agents acting concurrently and independent of each other. We see that the time-out itself can be used to minimize the search time and the amount of energy that is consumed to find an object. An approximate formula is derived for the number of search agents that can help us guarantee that an object is found in a given time, and we discuss how the competition between search agents and other agents that try to hide the data object can be used by opposing parties to guarantee their own success.
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8	Title:	High-rate codes with sublinear-time decoding
	Author:	Swastik Kopparty, Shubhangi Saraf, Sergey Yekhanin
	Journal:	Journal of the ACM (JACM) Volume 61 Issue 5, August 2014, Article No. 28
	Abstract:	Locally decodable codes are error-correcting codes that admit efficient decoding algorithms; any bit of the original message can be recovered by looking at only a small number of locations of a corrupted codeword. The tradeoff between the rate of a code and the locality/efficiency of its decoding algorithms has been well studied, and it has widely been suspected that nontrivial locality must come at the price of low rate. A particular setting of potential interest in practice is codes of constant rate. For such codes, decoding algorithms with locality $O(k^{\epsilon})$ were known only for codes of rate $(1/k)^{\Omega(\epsilon)}$,

	where k is the length of the message. Furthermore, for codes of rate > 1/2, no nontrivial locality had been achieved. In this article, we construct a new family of locally decodable codes that have very efficient local decoding algorithms, and at the same time have rate approaching 1. We show that for every $\epsilon > 0$ and $\alpha > 0$, for infinitely many k, there exists a code C which encodes messages of length k with rate $1 - \alpha$, and is locally decodable from a constant fraction of errors using $O(k^{\epsilon})$ queries and time. These codes, which we call multiplicity codes, are based on evaluating multivariate polynomials and their derivatives. Multiplicity codes extend traditional multivariate polynomial codes; they inherit the local-decodability of these codes, and at the same time achieve better tradeoffs and flexibility in the rate and minimum distance.
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Title:	Fault-tolerant algorithms for tick-generation in asynchronous logic: Robust pulse generation
Author:	Danny Dolev, Matthias Függer, Ulrich Schmid, Christoph Lenzen
Journal:	Journal of the ACM (JACM) Volume 61 Issue 5, August 2014, Article No. 30
Abstract:	Today's hardware technology presents a new challenge in designing robust systems. Deep submicron VLSI technology introduces transient and permanent faults that were never considered in low-level system designs in the past. Still, robustness of that part of the system is crucial and needs to be guaranteed for any successful product. Distributed systems, on the other hand, have been dealing with similar issues for decades. However, neither the basic abstractions nor the complexity of contemporary fault-tolerant distributed algorithms match the peculiarities of hardware implementations. This article is intended to be part of an attempt striving to bridge over this gap between theory and practice for the clock synchronization problem. Solving this task sufficiently well will allow to build an ultra-robust high-precision clocking system for hardware designs like systems-on-chips in critical applications. As our first building block, we describe and prove correct a novel distributed, Byzantine fault-tolerant, probabilistically self-stabilizing pulse synchronization protocol, called FATAL, that can be implemented using standard asynchronous digital logic: Correct FATAL nodes are guaranteed to generate pulses (i.e., unnumbered clock ticks) in a synchronized way, despite a certain fraction of nodes being faulty. FATAL uses randomization only during stabilization and, despite the strict limitations introduced by hardware designs, offers optimal resilience and smaller complexity than all existing protocols. Finally, we show how to leverage FATAL to efficiently generate synchronized, self-stabilizing, high-frequency clocks.
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Title:	Privacy amplification with asymptotically optimal entropy loss
Author:	Nishanth Chandran, Bhavana Kanukurthi, Rafail Ostrovsky, Leonid Reyzin
Journal:	Journal of the ACM (JACM) Volume 61 Issue 5, August 2014, Article No. 29
Abstract:	We study the problem of "privacy amplification": key agreement between two parties who both know a weak secret w, such as a password. (Such a setting is ubiquitous on the internet, where passwords are the most commonly used security device.) We assume that the key agreement protocol is taking place in the presence of an active computationally unbounded adversary Eve. The adversary may have partial knowledge about w, so we assume only that w has some entropy from Eve's point of view. Thus, the goal of the protocol is to convert this nonuniform secret w into a uniformly distributed string R that is fully secret from Eve. R may then be used as a key for running symmetric cryptographic protocols (such as encryption, authentication, etc.). Because we make no computational assumptions, the entropy in R can come only from w. Thus, such a protocol must minimize the entropy loss during its execution, so that R is as long as possible. The best previous results have entropy loss of $\Theta(\mathbf{K}2)$, where **K** is the security parameter, thus requiring the password to be very long even for small values of **K**. In this work, we present the first protocol for information-theoretic key agreement that has entropy loss linear in the security parameter. The result is optimal up to constant factors. We achieve our improvement through a somewhat surprising application of error-correcting codes for the edit distance. The protocol can be extended to provide also "information reconciliation," that is, to work even when the two parties have slightly different versions of w (e.g., when biometrics are involved).
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