

## Computational awareness towards green environments

Neil Y. Yen · Cho-Li Wang · Sajid Hussain ·  
Jong Hyuk Park

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**Abstract** This special issue calls for high quality and state-of-the-art research issues and results concerning the development of green environment from the perspective of computing systems. In particular, the special issue is going to showcase the most recent achievements and developments in the realm of awareness computing. Original and research articles are solicited in all aspects of including theoretical studies, practical applications, new communication technology and experimental prototypes. This special issue includes original papers describing the latest developments, trends, and solutions of computational awareness towards green environments including green IT and cloud cluster computing, energy-efficient systems, power-aware software, awareness mechanism and modeling, context, emotion and preference awareness, energy harvesting, sensor, Ad Hoc, P2P networks, and communications, safety or security.

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N. Y. Yen  
The University of Aizu, Aizu-Wakamatsu, Japan  
e-mail: neilyyen@u-aizu.ac.jp

C.-L. Wang  
University of Hong Kong, Pokfulam, Hong Kong  
e-mail: clwang@cs.hku.hk

S. Hussain  
Fisk University, Nashville, USA  
e-mail: shussai@fisk.edu

J. H. Park (✉)  
Seoul National University of Science and Technology, Seoul, Korea  
e-mail: jhpark1@seoultech.ac.kr

## 1 Introduction

Awareness, by definition, refers to the state of perceptibility, consciousness and feels and implies vigilance in observing or alertness in drawing inferences from what one experiences. Its ultimate goal is to create systems that are able to be aware. Prospective examples, such as context awareness, safety and security awareness, power energy awareness, risk awareness, opportunity awareness, etc., are applied in a broad scope ranging from academic researches and commercial products. With the advances in awareness system development, objects are getting smart than they were expected to be. Unlike the conventional systems, they provide active services according to human being's need through the use of available information or resources around them. On the other hand, with dramatically increasing demands on computing systems, IT infrastructures have been scaled tremendously which results in huge amount of energy consumption, heat dissemination, greenhouse emission and even part of climate change. As such, the green issue has come to the picture seeking immediate solutions for computing systems to be energy-efficient and environmentally protected. Despite a wide body of research and development efforts, how to make systems, environments and their world green and sustained remains an open challenge.

We have received many manuscripts. Only 18 manuscripts with high quality were finally selected for this special issue. Each manuscript selected was blind reviewed by at least three reviewers consisting of guest editors and external reviewers. We present a brief overview of each manuscript in the following.

## 2 Related works

The first paper entitled "Performance Analysis Based Resource Allocation for Green Cloud Computing" by Lee et al. [1] presents a performance analysis-based resource allocation scheme for the efficient allocation of virtual machines on the cloud infrastructure. To maximize utilization and minimize total cost of the cloud computing infrastructure and running applications, resources need to be managed properly and virtual machines shall allocate proper host nodes to perform the computation. Green cloud computing is also becoming increasingly important in a world with limited energy resources and an ever-rising demand for more computational power. They experimented the proposed resource allocation algorithm using CloudSim and its performance is compared with two other existing models.

The second paper entitled "A Power-Efficient Vertical Handover with MIH-based Network Scanning through Consistency Check" by Joe et al. [2] presents a power-efficient scanning scheme considering the consistency of the information element (IE) for the media independent handover (MIH)-based vertical handover. They suggested the power saving scheme by extending the information and the event service of the MIH framework to reduce the number of full scanning. They also proposed the criteria to select the update MT to quantify the power consumption alongside various network scanning methods. Since, the frequent and multiple network scanning incurred by small mobile terminals (MT) is considerable, the scanning avoidance is essential for the framework. The MIH information service (MIIS) provides many usable factors and

features for the scanning avoidance. However, because of the absence of the criteria to select the update node, these values are not actually usable.

Next paper entitled “Efficient Duality-Based Subsequence Matching on Time-Series Data in Green Computing” by Park et al. [3] presents a subsequence matching method for green computing, which is called the efficient duality-based subsequence matching (simply, E-Dual Match). E-Dual Match handles all possible query windows for determining candidates. Hence, EDual Match not only reduces the false alarms, and improves the performance compared to Dual Match, but also does so by considering the main requirements of the green computing. E-Dual Match efficiently uses limited computer resources, accurate and energy efficient.

Next paper entitled “Cloud Computing-based Jam Management for a Manufacturing System in a Green IT Environment” by Jeong et al. [4] presents a method to efficiently manage jam status for manufacturing systems. For this purpose, a topic map was used. The topic model has topic types, associations, and occurrences, which relate to operational jam, system jam, and system components. All jam status information to support users is managed by XML specification, distinctly and efficiently.

Yu et al. [5] designed a new policy instead of the consistent hashing policy which is a combination of consistent hashing and sequential policy in a paper entitled “An Energy Conservation Replica Placement Strategy for Dynamo”. The basic idea of this policy is that it divides the nodes into groups and allows each other to be mirror nodes so it can find the full coverage subset of data items easily. Based on the model, they demonstrate that it can save up to 23.7 % energy and maintain load balancing of servers.

In the next paper entitled “Energy-Efficient Server Clusters to Perform Communication Type Application Processes”, Enokido et al. [6] consider communication type applications where a server transmits a large volume of data to clients. A client first selects a server in a cluster of servers and issues a file transmission request to the server. In this paper, they newly propose the transmission power consumption laxity-based (TPCLB) algorithm for a cluster of servers which are based on the TPC and ETPC models so that the total power consumption in a cluster of servers can be reduced.

In the next paper entitled “On Improvement of Cloud Virtual Machine Availability with Virtualization Fault Tolerance Mechanism”, Yang et al. [7] used current open-source software and platforms, for instance, the Xen-Hypervisor virtualization technology, and the OpenNebula virtual machines management tool. After extending components capabilities, they developed a mechanism to support their ideas and reached high availability with Hadoop that is also called as virtualization fault tolerance (VFT).

Next paper entitled “On Private Hamming Distance Computation” by Wong et al. [8] study the design of an efficient and secure protocol to facilitate the Hamming distance computation between two semi-honest parties. In this protocol design, both parties are constrained to ensure that no extra information will be revealed other than the computed result and further, the output of the protocol is according to the prescribed functionality. To achieve these requirements, they utilize a multiplicative homomorphic cryptosystem and include chaff data into the computation.

Yen et al. [9] propose a hybrid analog/digital mechanism of two-dimensional structure of wavelength-hopping and time-spreading coding optical code-division multiple-access (OCDMA) system for future generation communication and network technolo-

gies in a entitled “Hybrid Analog/Digital Wavelength-Time Optical CDMA Systems in Radio-over-Fiber Transmissions”. They employ low cost broadband light sources which can mitigate the sampling rate of optical switch and as the advantage of power saving.

Next paper entitled “Recommendation of Location-Based Services Based on Composite Measures of Trust Degree” by Li et al. [10] presents the credibility of recommended services, and proposes a set of composite measures on how to provide more reliable services. They further propose the trusty Skyline of LBS recommendation in terms of the trust degree based on the newly introduced composite measures to achieve more credibility to provide recommendation services. Experimental results show that their method can recommend desired and trusted services to users.

In the entitled “Correcting Vindictive Bidding Behaviors in Sponsored Search Auctions”, Tsung et al. [11] aim to develop a pricing mechanism that reduces the effects resulted by vindictive advertisers who bid on sponsored search auctions run by search engine providers. This proposed mechanism decreases the payment to make up for the utility loss that is induced by vindictive bidding. The vindictive advertiser is simultaneously punished with an additional payment. According to their theoretical analyses and simulations, the proposed mechanism efficiently decreases the effects that result from vindictive bidding, and guarantees equilibrium outcomes.

In the next paper entitled “GAER: Genetic Algorithm based Energy-Efficient Routing Protocol for Infrastructure-less Opportunistic Networks” by Dhurandher et al. [12], a novel routing protocol named Genetic Algorithm based Energy-efficient Routing (GAER) protocol for infrastructure-less Oppnets is proposed. This protocol uses a node’s personal information, and then applies the Genetic Algorithm (GA) to select a better next hop among a group of neighbor nodes for the message to be routed to the destination. With the application of GA, optimal results are obtained that help in the selection of the best possible node as the next hop, which in turn, leads to prolonged battery life. Simulation results show that GAER outperforms the Epidemic, PROPHET, and Spray and Wait protocols in terms of messages delivered, overhead ratio, average residual energy, and number of dead nodes.

In the entitled “Automated and Coupled Services of Advanced Smart Surveillance Systems toward Green IT: Tracking, Retrieval and Digital Evidence”, Park et al. [13] propose the advanced smart surveillance system for wide-areas which is capable of the automated tracking and retrieval of target object and digital evidence-video collection. Furthermore, they considered the multiple-camera environment with non-overlapping views which includes more constraint conditions by various light changes. This system enables real-time object tracking, fast post-retrieval and selective digital evidence collection with economy of time, manpower, memory devices and energy consumption. Also, this system is more energy-efficient since their schemes are organically connected to each other.

Next paper entitled “Group Improved Enhanced Dynamic Frame Slotted ALOHA Anti-collision Algorithm” by Wang et al. [14] presents a new anti-collision algorithm called Group Improved Enhanced Dynamic Frame Slotted ALOHA (GroupIEDFSA) by estimating the number of unread tags  $\_rst$ , comparing the maximum frame size and dividing tags into groups when the number of tags which are activated is large. What is more, compared with Enhanced Dynamic Frame Slotted ALOHA (EDFSA)

Algorithm in the process of identification, GroupIEDFSA Algorithm will combine new group based on the unread tags' number.

In the entitled "On Design and Validation of SNSP - A Novel Real-Time Communication Protocol for Safety-Critical Applications", Zhou et al. [15] proposes the Safe Node Sequence Protocol (SNSP), which is a variant of full time-triggered protocol TTP/C. The potential impact of global time, such as byzantine clock failure, on the protocol is eliminated. At the same time, the formal verification of SNSP is much easier in the absence of global time. Moreover, They model the protocol and use formal checker SPIN to validate the basic fault tolerant requirement of SNSP.

Next paper entitled "An Optimal Control Policy to Realize Green Cloud Systems with SLA-awareness" by Ouyang et al. [16] presents a implement for working vacation (WV) to lower and elimination for an unnecessary power consumed by idle servers. Two green systems are first proposed of where one implements a single WV and the other implements multiple WVs in an operational cycle. The effect of various service rates and WV lengths on system delay and operating state probabilities are compared and studied.

In the entitled "Assessment of Human Perceptual Sensitivity to Physically Non-Conforming Motion in Virtual Environments", Choi et al. [17] propose a virtual reality-based assessment tools for measuring human perceptual sensitivity to dynamic erroneous motions, particularly designed to assess possible early stage of brain damages and its associated visual dysfunctions. The main thrust of this paper is on perceptually tuned virtual reality system that can produce realistic natural behavior. The proposed method contains multiple assessment layers to check the awareness of erroneous motion in natural scenes at various severities. The virtual reality-based game type environment provides an effective test bed for various dynamic motion-based perceptual sensitivity experiments.

The last paper entitled "An Enhanced Integrity of Web Contents through Mobile Cloud Environments" by Choi et al. [18] presents a authentication approach for a snapshot of web contents on PC or mobile devices. They focus on authentication of web content. The web contents have features certainly seem to have escalated in frequency. Web data cover a variety of platforms, metadata and file types, so electronic authentication of web contents must take care to choose a method that collects the content and data required for authentication. This technology leverages a secure authentication by extraction of the feature values from image, then they make use of MD5 for data integrity and public key crypto system for digital signature. This approach enables us to verify data integrity for a snapshot of web content.

### 3 Conclusion

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