EDITORIAL

JOURNAL OF INFORMATION PROCESSING SYSTEMS **JIPS**

New Approaches to Advanced Network and Image Processing

Jong Hyuk Park*

Editor-in-Chief, *JIPS*

1. Introduction

The *Journal of Information Processing Systems (JIPS)* publishes a broad array of subjects related to information communication technology across prevalent and advanced fields including system, network, architecture, algorithm, application, security, and so forth. As the official international journal published by the Korean Information Processing Society and a prominent, multidisciplinary journal throughout the world, JIPS is being indexed in ESCI, SCOPUS, EI COMPENDEX, DOI, DBLP, EBSCO, Google Scholar, and CrossRef. The purpose of JIPS is to provide a prominent, influential forum wherein researchers and professionals gather to promote, share, and discuss all major research issues and developments. Published theoretical and practical articles have contributed to related research areas by presenting new techniques, concepts, or analyses, featuring experience reports, experiments involving the implementation and application of new theories, and tutorials on state-of-the-art technologies related to information processing systems. The subjects covered by this journal include, but are not limited to, topics related to computer systems and theories, multimedia systems and graphics, communication systems and security, and software systems and applications.

In this issue, 15 peer-reviewed papers are published including an invited paper by Professor Witold Pedrycz. It contains diverse papers in the area of advanced network and image processing including cloud computing, object tracking, image search and quality assessment, GPS tracking, fire detection, WSN, multimedia mobile network, and so forth. It also includes experience reports, experiments that involve the implementation and application of new theories, and tutorials on state-of-the-art technologies related to information processing systems.

2. Related Works

Including an invited paper, this issue published 15 original papers. We would like to introduce the approach and contributions for each of the included papers. First, Pedrycz [1] presents a new proposal

Corresponding Author: Jong Hyuk Park (jhpark1@seoultech.ac.kr)
* Dept. of Computer Science and Engineering, Seoul National University of Science & Technology (SeoulTech), Seoul, Korea (jhpark1@seoultech.ac.kr), http://www.parkjonghyuk.net

for designing bidirectional associative memories (BAM) to reduce the bidirectional recall error using collaborative fuzzy clustering. The author shows that the proposed design provides outstanding outcomes. First, the configuration of the best mappings is formed using landmarks whose location in the data space captures the core attributes of the data. The underlying clustering technology includes collaboration mechanisms to help deploy prototypes in a way that fully reflects the bi-directionality of the recall. Moreover, the quality of non-ideal associative recall can optimize the granularity of information based on the scope of information and specificity.

Wang et al. [2] suggest a novel indexing method for blind image quality assessment (BIQA) based on Gaussian blur distortion images. For example, in various files using a smart device, the image has an important role in communication, such as social networks. Note, however, that the quality of the image generally deteriorates through distortions during acquisition and processing due to various conditions [3]. Thus, a study on image quality assessment (IQA) is quite important to measure the image quality using models that are consistent with subjective assessments. The proposed scheme conducts experiments based on various discriminations using the human visual system (HVS) and structure tensor & structural similarity (SSIM). Those numerous experiments show that their proposed indexing method is highly consistent with the subjective quality assessment.

Bu et al. [4] present a content-based image retrieval method that blends color and texture features extracted by multi-resolution multi-direction (MRMD) filtering. Currently, image retrieval technologies have been mainly concentrating on content-based image retrieval that can objectively define and process visual information automatically [5,6]. To enhance the accuracy rate, they suggest the retrieval method of combining color and texture features extracted from MRMD filtered images based on DB of various images including Corel DB and VisTex DB. The experiment results show that the proposed method delivers a statistically significant performance compared with other related methods such as SCD (scalable color descriptor) and CSD (color structure descriptor).

Rathod and Reddy [7] propose a secure migration framework for decentralizing virtual machines (VMs) in the centralized cloud environment. VM migration is still a hot issue of virtualization computing; on the other hand, secure VM migration methods have been discussed to prevent data from being compromised [8,9]. Major contributions of the proposed architecture include avoiding central failures and providing a secure tunnel for context switching.

Chu et al. [10] propose a novel approach to fast ground segmentation for 3D point cloud. Their approach provides a fast, effective method of segmenting ground and non-ground points gained from 3D laser points acquired from the Velodyne LiDAR sensor on the autonomous moving system. Their suggested fast ground segmentation is called local point cloud. It is taken from the Velodyne LiDAR sensor frame by frame, which contains numerous 3D points. All points in each frame are in local coordinates, and the original coordinate is the sensor's position. Their algorithm segments each frame, which need not be converted into global coordinates. The experiments show that the proposed algorithm achieves outstanding results on data acquired in both flat and sloped environments.

Zhao and Chen [11] present an improved zone-based routing protocol for heterogeneous wireless sensor networks to reduce energy consumption and increase the entire network lifetime. The proposed protocol selects the path that chooses minimum energy consumption as the optimal routing path to reduce energy consumption further. The experiment results prove that it has better stability period and longer network lifetime in comparison to the current protocols.

Kim et al. [12] describe a CUBRID-based distributed parallel query processing system that is able to handle multiple queries. CUBRID shard [13] is an open source project for SQL-based RDBM (relational database management system) to handle big data management effectively. Note, however, that the CUBRID Shard can only respond to user queries if the client needs to access a single CUBRID service. The authors have focused on this limitation, and they suggest distributed parallel query processing to answer a user's query in a parallel, distributed manner. The proposed system achieved better performance than the existing CURBID shard during the evaluation experiments.

Meng et al. [14] present an improved scheme for open window time ratio (OPW-TR). The GPS trajectory data usually produce massive amounts, which is challenging to process effectively. In this issue, various compression algorithms addressed the size reduction and minimization of loss of trajectory data. The proposed algorithm focuses on reducing synchronized Euclidean distance (SED) errors. This algorithm compresses trajectory data by calculating the point's accumulated synchronized Euclidean distance (ASED) through the removal of redundant points to reduce storage spaces and improvement of efficiency of data processing and transmission.

Jung and Kim [15] describe a novel algorithm for the multiple multicast tree construction to reduce network cost and maintain user service quality. Among related algorithms, the group Takahashi and Matsuyama (GTM) algorithm is the most commonly researched in multiple multicast tree construction because it was born in the advent of software-defined networking (SDN). Note, however, that the GTM algorithm considers only the network cost overhead, not the temporary service disruption from a link change. Thus, the proposed algorithm can reduce network cost while avoiding considerable degradation of service quality for users by considering both network cost and link-change overhead of users.

Singh et al. [16] suggest an alternative solution for preventing cyberbullying using a mobile game. Cyberbullying has been a serious problem in social media platforms in recent years, involving mobile devices. There is no definite solution to prevent it, but the academe chooses an approach to reduce the rate of cyberbullying acts [17,18]. Thus, they propose the Mobile Digital Etiquette Game (MDEG), which trains primary school children through scenario-based questions that would be more suitable for their age. It can test students on their understanding through a combination of questions and multiple-choice questions.

Zhu et al. [19] present a mechanism for enabling the trusted party to encrypt the floating-points through the homomorphic encryption algorithm and perform summations on their ciphertexts with confidentiality. Currently, the encryption-based relational database system has been actively researched for maintaining confidentiality and protecting data stored in the cloud. The first step in the proposed methodology is to encode a floating-point number to hide the decimal point and the positive or negative sign. Next, the floating-point code is encrypted with the homomorphic encryption algorithm and stored sequentially in the cloud. Their suggestion is mainly to discuss the query using the SUM aggregate function for the floating-point data type, but it is limited because it is inappropriate to query the floating point.

Jun et al. [20] propose an approach based on the fire detection method using multichannel information and gray level co-occurrence matrix (GLCM) image features. Their method is based on flame and smoke detection, which is sensitive to flame color and smoke texture information, using a machine learning system. The experimental results show better performance than existing methods in terms of fire detection accuracy.

Ali et al. [21] introduce a new watermarking method for a still image, which is aimed at copyright protection. The procedure for embedding the watermark is based on transforming domains. Mainly, the discrete cosine transform (DCT) is exploited in this idea wherein the watermark is embedded in the selected coefficients according to several criteria. The experimental results prove that the proposed method shows good imperceptibility and robustness against various compromise attacks.

Gan et al. [22] propose a new forwarding scheme called History Encounter-based Spray-and-Wait Protocol (HESnW) in delay-tolerant networks (DTNs). DTNs [23,24] are one of the challenging networks because they are occasionally connected, which can increase the latency of end-to-end transmission arbitrarily. Among the methods of solving the aforesaid problem, a bundle hierarchy consisting of a store-carry-forward paradigm and a custody transfer idea is presented [25]. This paper suggests that the algorithm exploits the history performance of both sender and receiver to design the next hop. It comprehensively considers the potential ability of both sender and receiver nodes. The simulation for performance test shows that their scheme incurs lower delivery cost than existing algorithms.

Lee and Lee [26] suggest the cooperative relaying system (CRS) based on opportunistic non-orthogonal multiple access (NOMA) with channel state information (CSI). Non-orthogonal multiple access (NOMA) is one of the superior techniques for improving the spectral efficiency of wireless multi-user systems [27]. The NOMA scheme uses a power domain for multiple accesses, and it can be implemented as superposition coding, which allows the transmitter to transmit data signals to different receivers at different powers simultaneously [28]. The source using CSI instantaneously chooses between direct transmission and cooperative NOMA transmission for opportunistic transmission. They provide the opportunistic NOMA-based CRS under Rayleigh fading channels to achieve the average rate of an asymptotic expression. They show that the proposed NOMA-based CRS achieves better speed performance than the conventional one as the transmission SNR increases.

3. Conclusion

In this issue, we present 15 important and original papers from around the world. We introduce state-of-the-art research on subjects from image search and assessment, object tracking, cloud computing, and mobile network to WSN. More than anything else, however, we deeply appreciate all of the authors who have contributed to this issue by sharing their valuable research outcomes with us. We also want to express our sincere thanks to all the reviewers who kindly accepted our review invitations. Without their hard work, putting together this high-quality journal would not have been possible.

References

[1] W. Pedrycz, "Granular bidirectional and multidirectional associative memories: towards a collaborative buildup of granular mappings," *Journal of Information Processing Systems*, vol. 13, no. 3, pp. 435-447, 2017. http://doi.org/10.3745/JIPS.02.0058.
[2] L. Wang, C. Wang, and X. Zhou, "Blind image quality assessment on Gaussian blur images," *Journal of Information Processing Systems*, vol. 13, no. 3, pp. 448-463, 2017. http://doi.org/10.3745/JIPS.02.0059.

[3]   L. J. Karam, T. Ebrahimi, S. S. Hemami, T. N. Pappas, R. J. Safranek, Z. Wang, and A. B. Watson, "Introduction to the issue on visual media quality assessment," *IEEE Journal of Selected Topics in Signal Processing*, vol. 3, no. 2, pp. 189-192, 2009.

[4]   H. H. Bu, N. C. Kim, C. J. Moon, and J. H. Kim, "Content-based image retrieval using combined color and texture features extracted by multi-resolution multi-direction filtering," *Journal of Information Processing Systems*, vol. 13, no. 3, pp. 464-475, 2017. http://doi.org/10.3745/JIPS.02.0060.

[5]   Y. D. Chun, N. C. Kim, and I. H. Jang, "Content-based image retrieval using multiresolution color and texture features," *IEEE Transactions on Multimedia*, vol. 10, no. 6, pp. 1073-1084, 2008.

[6]   S. Agarwal, A. K. Verma, and P. Singh, "Content based image retrieval using discrete wavelet transform and edge histogram Descriptor," in *Proceedings of International Conference on Information Systems and Computer Networks*, Mathura, India, 2013, pp. 19-23.

[7]   S. B. Rathod and V. K. Reddy, "NDynamic framework for secure VM migration over cloud computing," *Journal of Information Processing Systems*, vol. 13, no. 3, pp. 476-490, 2017. http://doi.org/10.3745/JIPS.01.0015.

[8]   H. Jin, W. Gao, S. Wua, X. Shi, X. Wu, and F. Zhou, "Optimizing the live migration of virtual machine by CPU scheduling," *Journal of Network and Computer Applications*, vol. 34, no. 4, pp. 1088–1096, 2011.

[9]   D. Loreti and A. Ciampolini, "A decentralized approach for virtual infrastructure management in cloud datacenters," *International Journal on Advances in Intelligent Systems*, vol. 7, no. 3-4, pp. 507-518, 2014.

[10]   P. Chu, S. Cho, S. Sim, K. Kwak, and K. Cho, "A fast ground segmentation method for 3D point cloud," *Journal of Information Processing Systems*, vol. 13, no. 3, pp. 491-499, 2017. http://doi.org/10.3745/JIPS.02.0061.

[11]   L. Zhao and N. Chen, "An improved zone-based routing protocol for heterogeneous wireless sensor networks", *Journal of Information Processing Systems*, vol. 13, no. 3, pp. 500-517, 2017. http://doi.org/10.3745/JIPS.03.0072.

[12]   H. I. Kim, H. Yang, M. Yoon, and J. W. Chang, "Development of a CUBRID-based distributed parallel query processing system," *Journal of Information Processing Systems*, vol. 13, no. 3, pp. 518-532, 2017. http://doi.org/10.3745/JIPS.01.0016.

[13]   CUBRID Shard [Online]. Available: http://www.cubrid.com/manual/91/shard.html.

[14]   Q. Meng, X. Yu, C. Yao, X. Li, P. Li, and X. Zhao, "Improvement of OPW-TR algorithm for compressing GPS trajectory data," *Journal of Information Processing Systems*, vol. 13, no. 3, pp. 533-545, 2017. http://doi.org/10.3745/JIPS.03.0073.

[15]   H. Jung and N. Kim, "Multicast tree construction with user-experienced quality for multimedia mobile networks," *Journal of Information Processing Systems*, vol. 13, no. 3, pp. 546-558, 2017. http://doi.org/10.3745/JIPS.01.0017.

[16]   M. M. Singh, P. J. Ng, K. M. Yap, M. H. Husin, and N. H. A. H. Malim, "Cyberbullying and a mobile game app? An initial perspective on an alternative solution," *Journal of Information Processing Systems*, vol. 13, no. 3, pp. 559-572, 2017. http://doi.org/10.3745/JIPS.04.0033.

[17]   European Network and Information Security Agency, "Cyber-bullying and online grooming: helping to protect against the risks," 2011 [Online]. Available: https://www.enisa.europa.eu/publications/Cyber-Bullying%20and%20Online%20Grooming.

[18]   R. Dredge, J. Gleeson, and X. P. Garcia, "Cyberbullying in social networking sites: an adolescent victim's perspective," *Computers in Human Behavior*, vol. 36, pp. 13-20, 2014.

[19]   T. Zhu, X. Zou, and J. Pan, "Query with SUM aggregate function on encrypted floating-point numbers in cloud," *Journal of Information Processing Systems*, vol. 13, no. 3, pp. 573-589, 2017. http://doi.org/10.3745/JIPS.04.0034.

[20]   J. H. Jun, M. J. Kim, Y. S. Jang, and S. H. Kim "Fire detection using multi-channel information and gray level co-occurrence matrix image features," *Journal of Information Processing Systems*, vol. 13, no. 3, pp. 590-598, 2017. http://doi.org/10.3745/JIPS.02.0062.

[21]   S. A. Ali, M. J. Jawad, and M. A. Naser, "Copyright protection for digital image by watermarking technique," *Journal of Information Processing Systems*, vol. 13, no. 3, pp. 599-617, 2017. http://doi.org/10.3745/JIPS.03.0074.

[22] S. Gan, J. Zhou, and K. Wei, "HESnW: History Encounters-Based Spray-and-Wait routing protocol for delay tolerant network", *Journal of Information Processing Systems*, vol. 13, no. 3, pp. 618-629, 2017. http://doi.org/10.3745/JIPS.03.0075.

[23] S. Burleigh, A. Hooke, L. Torgerson, K. Fall, V. Cerf, B. Durst, K. Scott, and H. Weiss, "Delay-tolerant networking: an approach to interplanetary internet," *IEEE Communications Magazine*, vol. 41, no. 6, pp. 128-136, 2003.

[24] K. Fall, "A delay-tolerant network architecture for challenged internets," in *Proceedings of the 2003 Conference on Applications, Technologies, Architectures, and Protocols For Computer Communications*, Karlsruhe, Germany, 2003, pp. 27-34.

[25] J. Cao, Y. Zhang, L. Xie, and G. Cao, "Consistency of cooperative caching in mobile peer-to-peer systems over MANET," *International Journal of Parallel Emergent and Distributed Systems*, vol. 21, no. 3, pp. 573-579, 2006.

[26] I. H. Lee and H. Lee, "Achievable rate analysis for opportunistic non-orthogonal multiple access-based cooperative relaying systems," *Journal of Information Processing Systems*, vol. 13, no. 3, pp. 630-642, 2017. http://doi.org/10.3745/JIPS.03.0076.

[27] Z. Ding, Z. Yang, P. Fan, and H. V. Poor, "On the performance of non-orthogonal multiple access in 5G systems with randomly deployed users," *IEEE Signal Processing Letters*, vol. 21, no. 12, pp. 1501-1505, 2014.

[28] H. T. Do and S. Y. Chung, "Linear beamforming and superposition coding with common information for the Gaussian MIMO broadcast channel," *IEEE Transactions on Communications*, vol. 57, no. 8, pp. 2484-2494, 2009.

James J. (Jong Hyuk) Park http://orcid.org/0000-0003-1831-0309
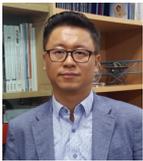
He received Ph.D. degrees in Graduate School of Information Security from Korea University, Korea and Graduate School of Human Sciences from Waseda University, Japan. From December 2002 to July 2007, Dr. Park had been a research scientist of R&D Institute, Hanwha S&C Co., Ltd., Korea. From September 2007 to August 2009, he had been a professor at the Department of Computer Science and Engineering, Kyungnam University, Korea. He is now a professor at the Department of Computer Science and Engineering and Department of Interdisciplinary Bio IT Materials, Seoul National University of Science and Technology (SeoulTech), Korea. Dr. Park has published about 200 research papers in international journals and conferences. He has been serving as chairs, program committee, or organizing committee chair for many international conferences and workshops. He is a founding steering chair of some international conferences—MUE, FutureTech, CSA, UCAWSN, etc. He is editor-in-chief of *Human-centric Computing and Information Sciences (HCIS)* by Springer, *The Journal of Information Processing Systems (JIPS)* by KIPS, and *Journal of Convergence (JoC)* by KIPS CSWRG. He is Associate Editor / Editor of 14 international journals including 8 journals indexed by SCI(E). In addition, he has been serving as a Guest Editor for international journals by some publishers: Springer, Elsevier, Wiley, Oxford University press, Hindawi, Emerald, Inderscience. His research interests include security and digital forensics, human-centric ubiquitous computing, context awareness, multimedia services, etc. He got the best paper awards from ISA-08 and ITCS-11 conferences and the outstanding leadership awards from IEEE HPCC-09, ICA3PP-10, IEE ISPA-11, and PDCAT-11. Furthermore, he got the outstanding research awards from the SeoulTech in 2014. Dr. Park's research interests include human-centric ubiquitous computing, vehicular cloud computing, information security, digital forensics, secure communications, multimedia computing, etc. He is a member of the IEEE, IEEE Computer Society, KIPS, and KMMS.