Multimedia technology for pervasive computing environment

Jong Hyuk Park · Zhiwen Yu · Liang Zhou

Abstract With the emerging multimedia techniques which can be used for various pervasive and ubiquitous applications such as healthcare, environmental monitoring, security and surveillance, there are a number of important challenges that arise when multimedia transmits in this kind of pervasive computing environments. This special issue is called for high-quality, up-to-date related multimedia technology for pervasive computing environment. In this special issue, we have accepted only nine high-quality papers. We expect that this special issue will be a trigger for further related research and technology improvements in multimedia technology for pervasive computing environment.

Keywords Multimedia technology · Pervasive computing · Reliable video surveillance · Visualize Web anomaly attacks

1 Introduction

Pervasive computing environment (PCE) is the trend towards increasingly ubiquitous connected computing devices in the environment, a trend being brought about by a

J.H. Park (✉)
Department of Computer Science and Engineering, SeoulTech, Seoul, Korea
e-mail: jhpark1@seoultech.ac.kr

Z. Yu
Department of Computer Science and Engineering, School of Computer Science, Northwestern Polytechnical University, Xi'an, China
e-mail: zhiwenyu@nwpu.edu.cn

L. Zhou
Laboratory of Electronics and Computer Engineering, ENSTA-ParisTech, Paris, France
e-mail: liang.zhou@ieee.org

convergence of advanced electronic and communications technologies. Meanwhile, the rapid expansion of multimedia services from voice communications to high performance video in recent years is an indication that significant value is placed on multimedia applications as key innovations for both academia and industry. With the emerging multimedia techniques which can be used for various pervasive and ubiquitous applications such as healthcare, environmental monitoring, security and surveillance, there are a number of important challenges that arise when multimedia transmits in this kind of PCE. This special issue is focused on pervasive multimedia services and applications, multimedia personalization and adaptation, multimedia systems and architecture, interactive multimedia systems, system models and parameters for pervasive multimedia applications, security mechanisms and schemes for multimedia communications, and so on.

We have received many manuscripts. After blind-review process by at least three reviewers, we have accepted only nine high-quality papers. We present a brief overview of each paper in the next section.

2 Related works

The first paper entitled "Fast Spatial Averaging: An Efficient Algorithm for 2D Mean Filtering" by Songyot Nakariyakul [1] presents a new fast spatial averaging technique that efficiently implements operations for spatial averaging or two-dimensional mean filtering. The proposed method requires approximately 4MN additions and no division since the major computations required by the algorithm depend only on the size of the original image but not on the size of the averaging filter. In addition, the experimental results on various image sizes using different filter sizes prove to be significantly faster than other spatial averaging algorithms.

In the second paper entitled "Bridging the Semantic Gap in Multimedia Emotion/Mood Recognition for Ubiquitous Computing Environment," Seungmin Rho and Sang-Soo Yeo [2] introduce the existing emotion models and acoustic features in multimedia technology for pervasive computing environment. The multimedia emotion/mood could be used as an important clue in multimedia understanding, retrieval, recommendation, and some other multimedia applications. Many issues for multimedia emotion recognition have been addressed by different disciplines. They also present a comparison of different emotion/mood recognition methods.

The third paper entitled "Enabling Low Bit-rate and Reliable Video Surveillance over Practical Wireless Sensor Network" by Min Chen et al. presents an energy-efficient image transportation strategy through motion detection. In case of data delivery over long distance, this paper further investigates the use of cooperative communications to design a reliable image transmission scheme over wireless sensor network. In addition, they demonstrate effectiveness of the proposed scheme in improving network reliability in wireless multimedia sensor networks [3].

In the fourth paper entitled "A Novel Approach to Visualize Web Anomaly Attacks in Pervasive Computing Environment" by Bonhyun Koo et al. [4], a multimedia visualization approach for pervasive computing environment is proposed which analyzes HTTP request and response header information to detect and visualize multimedia

web attacks based on the Bayesian method. The authors conducted experiments of some cases for the verification of the proposed approach in a real environment. In addition, the proposed approach can be considered for web attack detection visualization, scanning and password attack visualization, and attacker's position tracking visualization.

The fifth paper entitled "Scalable Multimedia Delivery with QoS Management in Pervasive Computing Environment" by Hongguang Zhang et al. introduces a Scalable Multimedia Delivery (SMD) framework with QoS management. This framework utilizes the CAM4Home metadata model to aggregate multimodal rich media services into a bundle. MPEG-21 metadata is integrated into the CAM4Home model to enforce interoperable QoS management. The authors further develop the SMD system in IP Multimedia Subsystem (IMS) architecture, where multimedia adaptation is implemented through application-level QoS negotiation [5].

In the sixth paper entitled "Vision-based Arm Gesture Recognition for a Long-range Human–Robot Interaction" DoHyung Kim et al. propose a vision-based human arm gesture recognition method for human–robot interaction. Particularly this approach is focused on a long distance where speech information is not available. The proposed method is capable of recognizing the defined gestures only with 320×240 pixel-sized low-resolution input images captured from a single camera at a long distance, approximately five meters from the camera. Furthermore, the proposed system differentiates the target gestures from the users' normal actions that occur in daily life without any constraints. For human detection at a long distance, the proposed approach combines results from mean-shift color tracking, short- and long-range face detection, and omega-shaped detection. In the experiments, a recognition rate of 97.235 % is achieved. The authors consider the proposed method as a sufficiently practical means for various pervasive and ubiquitous applications based on human gestures [6].

The seventh paper entitled "Real-time Vehicle Tracking Mechanism with License Plate Recognition from Road Images" by J.K. Chang et al. [7] proposes a new vehicle-tracking mechanism using license plate recognition technology. This approach is essential to having information about vehicles on the roads. The proposed method is a real-time processing system using multistep image processing, as well as recognition and tracking processes from 2D and 3D images. The experimental results of real environmental images in recognition and tracking using the proposed method are shown.

In the eighth paper entitled "Lifetime Maximization considering Target Coverage and Connectivity in Directional Image/Video Sensor Networks" [8], Yong-hwan Kim et al. address the Directional Cover and Transmission (DCT) problem of organizing the directional sensors into a group of non-disjoint subsets to extend the network lifetime. One subset in which the directional sensors cover all the targets and forward the sensed data to the sink is activated at one time, while the others sleep to conserve their energy. For the DCT problem proven to be the NP-complete problem, they present a heuristic algorithm is the Shortest Path from Target to Sink (SPTS)-greedy algorithm. To verify and evaluate the proposed scheme, the authors conduct extensive simulation and show that it can contribute to extending the network lifetime to a reasonable extent.

In the last paper entitled "Dynamic Load-balanced AP Association in Multi-hop Wireless Mesh Networks", Yong Cui et al. [9] propose a novel AP association-approach LBAA, taking the AP's load-balancing, the WMN's multi-hop characteristic, and the user's RSSI into consideration. They first propose a centralized algorithm and then extend it to a distributed one, with the latter one being more practical and convenient for deployment. Performance evaluation demonstrating the benefits of the proposed approach is given through a series of experiments in terms of collision probability, access bandwidth, end-to-end throughput, and average RSSI.

3 Conclusion

We would like to thank Prof. Hamid R. Arabnia, who is Editor-in-Chief of the Journal of Supercomputing, and editorial board members for the great support throughout the preparation and publication of our special issue. In addition, we thank all the authors for their contributions to this special issue. We also extend our thanks to the external reviewers for their excellent contributions in the review process for our special issue.

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