

Advanced IT-Based Future Sustainable Computing

Jong Hyuk Park ^{1,*} and Han-Chieh Chao ²

¹ Department of Computer Science and Engineering, Seoul National University of Science and Technology, Seoul 01811, Korea

² College of Electrical Engineering & Computer Science, National Ilan University, Yilan City, Yilan County 260, Taiwan; hcc@niu.edu.tw

* Correspondence: jamespark.seoul@gmail.com; Tel.: +82-2-970-6702

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Abstract: Future Sustainability Computing (FSC) is a novel research topic that deals with algorithms, procedures, and applications of information technologies for abundant life. In this Special Issue, we cover novel research and applications within the scope of sustainability computing dealing with hardware/software technologies, especially for frameworks and architectures. For example, topics include dynamic group management in Internet of Things (IoT); real-time video surveillance; security threats in Software Defined Network (SDN); real-time indoor Air-Quality level indicator; effectiveness of information systems security; load-balancing for inter-sensor convergence; neighbor discovery in sensor networks; transmission algorithm with Quality of Service (QoS) consideration; analysis of the relationship between Intrusion Detection System (IDS) alerts and darknet are included.

Keywords: sustainable computing; smart devices; cloud storage organization

1. Introduction

This is an editorial for the Special Issue, Advanced IT-Based Future Sustainable Computing, as elaborated upon below. One principle that embraces a range of algorithms, frameworks procedures, and architectures of advanced information technologies (IT) for improving daily life is Future Sustainability Computing (FSC). We face diverse kinds of sustainability problems in a variety of computing environments. This Special Issue covers novel approaches within the scope of sustainability computing dealing with hardware/software technologies, especially for frameworks and architectures.

During our working period, we received a variety of submissions from at least 10 countries. All these submissions were related to the scope of sustainability computing, dealing with hardware/software technologies. However, only fourteen novel papers were accepted under the strict review process. In particular, these accepted papers focused on various perspectives : Received Signal Strength Indicator (RSSI)-based distance estimation framework; dynamic group management in IoT; real-time video surveillance; security threats in SDN; human posture recognition; real-time indoor Air-Quality level indicator; practical firmware upgrade for wireless access point; effectiveness of information systems security; fuzzy graph; wearable technology; load-balancing for inter-sensor convergence; neighbor discovery in sensor networks; transmission algorithm with QoS consideration; and analysis of the relationship between IDS alerts and darknet.

2. Main Contributions

The first paper [1], entitled RSSI-Based Distance Estimation Framework Using a Kalman Filter for Sustainable Indoor Computing Environments, by Sung, Y., presents a RSSI framework that contains RSSI measurement, noise filtering, and revision processes for calculating the distance from a beacon to

an access point (AP) based on Bluetooth signals. The RSSIs are measured by one AP. A Kalman filter is utilized to eliminate noise. A log-distance path loss model is applied for revising the measured RSSIs.

The next paper [2], entitled Dynamic Group Management Scheme for Sustainable and Secure Information Sensing in IoT, by Kim, H., et al., introduces a method that utilizes the four kinds of fundamental arithmetic operator, substitution operator, and logical operator for the dynamically allocated cluster headers and groups. Group sensor nodes are authenticated and the keys are allocated for mutual authentication and confidential information transmission, which verify the distance between the group sensor nodes by utilizing the distance bounding.

The next paper [3], entitled Graphics Processing Unit (GPU)-Accelerated Foreground Segmentation and Labeling for Real-Time Video Surveillance, by Song, W., et al., presents a real-time segment method in video sequences. The foreground pixels are detected if the color of the foreground pixels does not locate around the peaks of the corresponding histograms. The background model of pixel-wise color histograms is created and then updated with new registered frames for recording color changes of all pixels. A foreground pixel and its neighboring foreground pixels with the minimum label among them are labeled repeatedly until all label values are determined.

In the next paper [4], entitled FS-OpenSecurity: A Taxonomic Modeling of Security Threats in SDN for Future Sustainable Computing, Sung, Y., et al. propose an architecture to improve network security by cutting down the overhead on SDN controllers. In order to reduce security risk, the proposed architecture contains for protection from diverse threats. To deploy the appropriate protections, the repositories of data are divided into knowledge of data resources and their assortments, knowledge of the organization and its information systems, and knowledge of threats.

In the next paper [5], entitled Infrared Human Posture Recognition Method for Monitoring in Smart Homes Based on Hidden Markov Model, Cai, X., et al. introduce an infrared human posture recognition method based on a Hidden Markov Model (HMM) for monitoring in sustainable smart homes. The proposed method tries to establish a model of training data according to the characteristics of human postures to effectively classify human postures, which improve the performance of practical applications.

In the next paper [6], entitled A Comprehensive Real-Time Indoor Air-Quality Level Indicator, Kang, J., et al. propose a tiny air-quality monitoring system. The applicability of the comprehensive Air-Quality Index (AQI) for a comprehensive indoor air-quality indication is validated. Design considerations for an IoT-based air-quality monitoring system are also described.

In the next paper [7], entitled Sustainable and Practical Firmware Upgrade for Wireless Access Point Using Password-Based Authentication, Jang, J., et al. introduce a sustainable and practical firmware upgrade protocol for Wireless access points (WAPs). The proposed protocol provides secure firmware upgrades using Transport Layer Security (TLS) and the Salted Challenge Response Authentication Mechanism (SCRAM) for WAPs. Therefore, the proposed upgrade can prevent man-in-the-middle (MITM) attacks by verifying the firmware server certificate using TLS.

In the next paper [8], entitled Leadership of Information Security Manager on the Effectiveness of Information Systems Security for Secure Sustainable Computing, Choi, M. introduces transformational leadership by information security managers that improve the effectiveness of ISS used by e-governments and take a central role in maintaining secure sustainable computing. This paper concludes with three important facts regarding the leadership of information security managers.

In the next paper [9], entitled Mining λ -Maximal Cliques from a Fuzzy Graph, Hao, F., et al. introduce a method of the λ -maximal clique mining over fuzzy graphs. The fuzzy formal context methodology is employed to discover the λ -maximal cliques from a fuzzy graph. This paper devises, explores and proves an algorithm based on the equivalence relationship between the maximal fuzzy equiconcept and λ -maximal cliques.

In the next paper [10], entitled Sustainable Wearables: Wearable Technology for Enhancing the Quality of Human Life, Lee, J., et al. describe the trend of wearable technology and discuss the definition of sustainable wearables. Wearable technology contains bodily status monitoring,

multi-wearable device control, and smart networking between wearable sensors. Sustainable wearables are defined in the context of improving the quality of an individual's life, social impact, and social public interest such as wellness, healthcare, assistance for the visually impaired, disaster relief, and public safety.

In the next paper [11], entitled Sustainable Load-Balancing Scheme for Inter-Sensor Convergence Processing of Routing Cooperation Topology, Kim, H., et al. propose an enhanced Sustainable Load-balancing Scheme. With the aim of bypassing sensor nodes with frequent routing, the number of sensor nodes and the battery consumption rate are considered. The number of sensor nodes is determined only by counting the sensor nodes that are connected to each Fixed Sensor Nodes (FSN) and Mobile Sensor Nodes (MSN). The battery consumption rate is considered given that the battery consumption rate provides effective big sensing data collection and transfer.

In the next paper [12], entitled Asymmetric Block Design-Based Neighbor Discovery Protocol in Sensor Networks, Choi, S., et al. propose a novel asymmetric neighbor discovery protocol for sensor networks based on block design. The concept of combinatorial block designs for their block combination scheme is applied. The proposed protocol is analyzed by the worst-case neighbor discovery latency numerically between their protocol and *Disco* and *U-Connect*. The worst-case latency of the proposed protocol is much lower than that of *Disco* and *U-Connect*.

In the next paper [13], entitled Transmission Algorithm with QoS Considerations for a Sustainable MPEG Streaming Service, Kim, S., et al. propose and suggest a sustainable MPEG streaming method maintaining Quality of Service (QoS) standard. Their method is adaptive given that one UDP (User Datagram Protocol) and one TCP (Transmission Control Protocol) is selected based on the size of the data, which improves the reliability of multimedia transmissions.

In the last paper [14], entitled Depth Analysis of IDS Alerts for Tracing and Identifying Potential Attackers on Darknet, Song, J., et al. introduce the sequential processes for the analysis between the IDS alerts and darknet traffic. Especially, they try to focus on the relationship between the internal hosts that send packets to the darknet and the IDS alerts. For the analysis, real data is collected at the Science and Technology Cyber Security Center (S & T CSC) in South Korea.

3. Conclusions

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Conflicts of Interest: The authors declare no conflict of interest.

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