



Special issue on ubiquitous computing and NextGen context-fusion

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This special issue is based on the best papers from the 14th International Conference on Mobile Systems and Pervasive Computing (MobiSPC'17) and the 12th International Conference on Future Networks and Communications (FNC'17) which were held in Leuven, Belgium, on 24–26, July 2017. Both conferences attracted a large number of scientific papers that contributed to the state-of-the-art in the areas of mobile computing and impending networks. All the papers selected for this special issue have been extended from their original versions and underwent three rounds of rigorous peer-review process. Based on the reviewers' feedback, as well as the evaluations of the Guest Editors, nine papers were selected for this special issue from 16 invited submissions. The accepted papers cover forthcoming development and emerging research along mobile computing and connected systems topics such as data confidentiality in cloud, secure mobile communication, cloud services integration, data processing on IoT gateway devices and digital image encryption techniques for wireless sensor networks.

The first paper by Khalid El Makkaoui et al. is entitled “*Speedy Cloud-RSA homomorphic scheme for preserving data confidentiality in cloud computing*”. The cloud environments are more threatened by security attacks and cloud consumers often access to cloud services using resource-constrained devices. The paper suggests two variants of Cloud-RSA scheme to speed up its decryption process,

Rebalanced Cloud-RSA and MultiPower Cloud-RSA. *Rebalanced Cloud-RSA* uses a modulus formed of two or more distinct primes and encrypts and decrypts using the CRT. *MultiPower Cloud-RSA* uses a modulus of the form $n = prqs$ (for $r \geq 2$ and $s \geq 1$), and decrypts employing the Hensel lifting and the CRT. The theoretical and simulation results in the paper show that the variants get a large decryption speedup over normal Cloud-RSA while maintaining a prescribed level of security. The proposed Rebalanced Cloud-RSA provides a faster decryption when using a small and secure modulus $n < 2048$ —bit numbers. Whereas, the MultiPower Cloud-RSA becomes more efficient with the increase in bit numbers of n .

The second paper by Charles Yaacoub et al. is entitled as “*Joint Source and Channel Coding with Systematic Polar Codes for Wireless Sensor Communication in Next Generation Networks*”. The paper proposes and investigates the use of systematic polar codes for joint-source channel coding of correlated sources in wireless sensor networks. The proposed scheme allows the compression of the volume of data to be transmitted over the network on one hand, and on the other hand, the protection of this data from channel impairments. Paper considered a Gaussian model to represent source correlation, and a Gaussian channel for transmission. The paper's results show that systematic polar codes can achieve a distributed compression with rates close to theoretical limits, with better error rates obtained for larger blocks, and a better robustness against transmission errors obtained with stronger compression and shorter block lengths.

The third paper by Olivier Debauche et al. is entitled “*Cloud Services Integration for Farm Animals' Behavior Studies Based on Smartphones as Activity Sensors*”. The paper exploits the user of mobile phones storage as well as the data harvested from the sensors mounted on them, especially to promote research for farm animals. The study of animal behavior using smartphones requires the storage of many high frequency variables from a large number of individuals and their processing through various relevant variables combinations for modeling and decision-making. Transferring, storing, treating and sharing such an amount

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of data is a big challenge. The paper propose a “lambda” architecture that is able to collect data at high frequency and is easily adaptable to many cases. The main originality of the proposed architecture lies on its ability to share the data and applications created by the different teams of scientists from a common database. This architecture is also able to integrate complementary data such as UAV images, and external data from other cloud platforms, such as health and production data.

The fourth paper by Mahmud Al-Osta et al. is entitled “*Event Driven and Semantic Based Approach for Data Processing on IoT Gateway Devices*”. In order to facilitate the task of IoT systems in detecting events and handling them on time, the paper proposes an approach for sensory data processing on IoT gateways. This is done by delegating the task (i.e., the real time data processing) to distributed edge devices (Gateways); taking into consideration their limited resources and network bandwidth. The proposed approach is a two-layer data processing approach that employs a hyped model encompassed of complex event processing (CEP) and semantic web (SW) techniques. The first layer is based on the notion of an event-driven data processing. It is intended to handle the event detection process, by which the collected data are aggregated and classified as events based on pre-defined classification rules and concepts. The second layer is proposed to filter and annotate sensory data using SW technologies. This layer supports the task of high-level IoT applications in terms of interpreting and consuming raw sensory data, which enable them to react to events in real life scenarios on time.

The fifth paper by Riadh Karchoud et al. is entitled “*One App to Rule Them All: Collaborative Injection of Situations in an Adaptable Context-Aware Application*”. Only one application per user, to perform all his/her tasks and manage the associated functionalities in a transparent manner, is an ideal solution that do not exist. Towards this end, the paper proposes a long-life application (LLA), a name that reflects the nature of the continuity and evolution that is needed. This application will evolve while running according to the users’ needs (considering his/her personal and/or professional requirements) and will continuously provide relevant context-adapted services.

The sixth paper by Tooba Batoool et al. is entitled “*CTASS: An Intelligent Framework for Personalized Travel Behaviour Advice to Cardiac Patients*”. The paper proposes a digital framework CTASS for personalized travel behaviour advice to cardiac patients. The patient’s travel behaviour is monitored by the apps, objectifying the activity of a patient. The behaviour is analyzed semi-automatically by means of a smart decision support system that helps doctors in providing a treatment that is personalized to the specific contexts (e.g. daily activity routine and demographic characteristics)

of the patient. In this way, travel related physical activity can be optimized and non-adherence to therapy can be detected.

The seventh paper by Alberto Huertas Celdran et al. is entitled “*Towards the Autonomous Provision of Self-Protection Capabilities in 5G Networks*”. Self-protection is a critical capability of self-organizing-networks (SON). It is focused on protecting the network resources in a flexible and autonomic way. To achieve self-protection, SON perform different processes ranging from the monitoring of network communications to the analysis, detection, and mitigation of cyber-attacks. Towards this end, the paper proposes an architecture that combines the software defined networking (SDN) and network functions virtualization (NFV) technologies to optimize the usage of network resources for monitoring services. A use case based on botnet detection in 5G networks shows how the proposed architecture ensures the provision of monitoring services in managing self-protection scenarios.

The eight paper by Muhammad Adnan et al. is entitled “*Last-mile Travel and Bicycle Sharing System in Small/Medium Sized Cities: User’s Preferences Investigation using Hybrid Choice Model*”. The paper present focus study on preference investigation of users within small/medium cities of Belgium where pro-rail PBSS has been launched to facilitate last-mile travel. Data was collected using web-based survey questionnaire from 30 such cities in the form of responses on stated preference (SP) scenarios, socio-economic characteristics, general travel habits and more importantly attitudes/perception on indicators of friendliness-to-cycling. Hybrid Choice Model (HCM) a relatively advanced technique was used to investigate user preference in the choice context along with the incorporation of respondent’s attitude/perception (unobservable characteristics) in the selection of Public Bike Sharing Schemes (PBSS) for their last-mile travel in multi-stage rail trip.

The ninth paper by Shaheen et al. is entitled “*Digital Image Encryption Techniques for Wireless Sensor Networks using Image Transformation Methods: DCT and DWT*”. In Wireless Sensor Networks (WSN), many encryption techniques are proposed. Sensor nodes have limited resources in memory, energy and processing capabilities; therefore, the proposed techniques must consider these limitations. The paper proposed two algorithms the discrete cosine transform (DCT) and the discrete wavelet transform (DWT). The algorithms are designed, implemented and tested for a new digital image encryption technique for WSN. The algorithms are implemented using Matlab. The Contiki OS and its simulator Cooja are used to simulate the WSN environment. The DWT is found to outperform DCT through all the experiments conducted in the paper.

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