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Editorial

Enabling Technologies for Smart Mobile Services

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Mobile services have become an essential part of today's scientific and telecom market activities. Hence, mobile services belong to an essential segment of modern communication services. New trends in this area consist in smart services, that is, a variety of context-aware services. The context itself is driven by the human to mobile interaction or by the interaction of the mobile device with the surrounding objects, hence becoming part of an Internet of Things ecosystem that enables smarter infrastructure (smart grid, smart buildings, etc.). A wide research area is attributed to a number of factors, but mainly from a concurrency of advances in mobile software development that leverages the computation power of the device, energy savings, increasing battery capacity, advanced radio, and a combination of sensing abilities such as satnav, signal strength, and inertial measurements. Those mobile device capabilities give the ability to devices to become "smart" and enhance the human-computer experience and the amount of time that humans spend on their devices.

Those advancements, along with advancements in other areas such as Artificial Intelligence (AI), open avenues for modern mobile services to include advanced capabilities such as health care (e.g., home care service, emergency alerting), banking, and transportation (e.g., vehicular telemetry, smartphone driven self-driving). In addition, advancements in positioning systems, such as moving from Global Navigation Satellite System (GNSS) to modern technologies for indoor localization can expand the areas where user location can be identified from outdoor to indoor, hence creating holistic location-aware service deployments.

However, the smartphone devices require complicated backend systems that can scale up and down based on the user growth and demand. The fact that people are spending more and more time with their smartphones means that backend services must scale horizontally at a higher pace. Hence, parallel technological evolution in cloud computing allows more and more services to receive faster adoption.

This special issue of fourteen selected papers is addressed to researchers and engineers practicing in the scientific areas of mobile services.

The paper entitled "Selective Mobile Communication within a Coverage Area Bounded by Radiating Cables" by H. Behairy et al. presents a novel technique to selectively control mobile phone services within a desired area. The proposed solution enables the area's maintainer to allow mobile phones on a whitelist to freely use mobile services without disruption while denying services to all other mobile phones that are within the boundaries of the desired area to be controlled. The proposed solution uses a base station controller to identify all mobile devices located within the controlled area, while an

antenna is placed inside the area to cause all mobile devices in the area to connect to the base station controller.

The paper "Multichannel Recorder for Low Frequency Signals: Application of Oscilloscope as Integrated Mobile Service for a Smartphone" by M. Kochlan et al. concerns a mobile solution in which the smart phone is used as the display device for the second device that is able to obtain low-frequency signal waveform. The authors describe a special system for low-frequency signal-data-sample acquisition, processing, and visualization which is implemented as a service on an Android-based smart device. The service allows a smart device to play the role of an oscilloscope or arbitrary waveform generator which is accessible remotely by Bluetooth. The design of whole solution aims for low power consumption requirements, simplicity, and user friendliness in application design. An application scenario was implemented as a wireless data acquisition system for power grid monitoring.

In the paper titled "Scalability Optimization of Seamless Positioning Service" by J. Machaj et al. a novel optimization algorithm for reduction of the number of transmitters to reduce the response time of a localization server in a modular positioning system is proposed. The motivation for the algorithm is to reduce the complexity of position estimation and thus provide a service that will have the lowest possible latency, since high latency of position estimation can significantly reduce the quality of user experience. Results of tests in real world Wi-Fi positioning conditions show that the proposed algorithm does not reduce the accuracy of position estimates. On the other hand, time measurements show that it has the potential to reduce the complexity of the positioning system, especially when large numbers of transmitters with low RSS values are present in the area of positioning.

The paper "An Enhanced Hybrid Social Based Routing Algorithm for MANET-DTN" by M. Matis et al. addresses an interesting topic and proposes a valuable solution for fully decentralized routing algorithms that combines features of both Dynamic Source Routing (DSR) and Social Based Opportunistic Routing (SBOR) algorithms. The performance evaluation section of the paper assesses the interesting aspects of the proposed solution and highlights pros and cons of the design choices.

The paper titled "Improved Association and Disassociation Scheme for Enhanced WLAN Handover and VHO" by S. Shin et al. investigates a new scheme for the determination of the handover point based on both the packet error rate and the signal-to-interference + noise ratio. Using the proposed scheme, the WLAN handover issues with short data interruption time and the throughput performance are improved even in the case where the user equipment is in the partial packet success region of the access point.

The paper entitled "Cooperation between Trust and Routing Mechanisms for Relay Node Selection in Hybrid MANET-DTN" by J. Papaj and L. Dobos is focussed on hybrid Mobile Ad Hoc Networks (MANET) and Delay Tolerant Networks (DTN). The authors' motivation is to select reliable and secure nodes to transport messages between isolated islands with limited connectivity. They introduce two novel algorithms that are activated if the connections are broken or disrupted. The algorithms leverage routing information and contact history to select reliable relay nodes.

The paper titled "Identification of Partitions in a Homogeneous Activity Group Using Mobile Devices" by N. Yu et al. investigates a new solution for dividing a large group of people into subgroups according to their behavior. Generally, people in public areas often appear in groups. People with homogeneous coarse-grained activities may be further divided into subgroups depending on more fine-grained behavioral differences. Automatic identification of these subgroups can be beneficial for a variety of applications. The work was focussed on identifying such subgroups in a homogeneous activity group. A generic framework using sensors available in commodity mobile devices is proposed. Authors evaluated the proposed approaches and results showed that the framework of multimodal approaches outperforms the original approach which works on a single sensing modality.

The paper entitled "Improving Indoor Localization Using Bluetooth Low Energy Beacons" by P. Kriz et al. is focussed on indoor localization by combining signals from Wi-Fi and Bluetooth Low Energy (BLE) iBeacons. The key advantage of BLE is low energy consumption; therefore battery-powered beacons can be deployed in locations where power access for Wi-Fi access points would be difficult. The authors performed an experimental study in a building using different configurations related to transmitter arrangements and combination of technologies, providing superior performance.

The paper "Indoor Localisation Based on GSM Signals: Multistorey Building Study" by R. Górak et al. considers indoor positioning using GSM digital mobile phone network signals. They present methods for estimating location by comparing the current readings of signal strength from several transmitters ("fingerprints") to a database of signal strength readings previously collected at a large number of known locations in the building and an experimental study of these methods in a six-floor academic building. The work's notable features include the use of neural networks, a novel approach to modelling time series information, a discussion of storey detection (a topic that is too often neglected in indoor positioning studies), and an impressively extensive set of experimental data.

In the paper titled "Daily Living Movement Recognition for Pedestrian Dead Reckoning Applications" by A. Martinelli et al., a generalized movement classifier for Pedestrian Dead Reckoning applications is proposed. An accelerometer signal is considered as the input to the movement segmentation procedure which exploits Continuous Wavelet Transform to detect and segment cyclic movements such as walking. Furthermore, segmented movements are provided to the supervised learning classifier in order to distinguish between activities such as walking and walking downstairs and upstairs. Results brought out that the walking downstairs movement has the highest false negative rate and is the one that produces more misclassification errors than other movements.

Within the framework of the usage of pervasive computing technologies for advertising purposes, the paper titled "Recommending Ads from Trustworthy Relationships in Pervasive Environments" by F. Martinez-Pabon et al. presents

a proposal for a collaborative filtering recommender system based on trust issues. According to the proposed analysis, the trust component is included in the recommendation algorithm by taking into account information entities from the social network Facebook and trust components between users.

The paper entitled "Novel Point-to-Point Scan Matching Algorithm Based on Cross-Correlation" by J. Konecny et al. focuses on mobile robot localization. In the paper a novel method with high accuracy and low computational costs is proposed. Extensive practical experiments show that the proposed algorithm is able to match the high accuracy of LiDAR scans and it is robust towards dynamic changes in the environment and moving objects. The comparison shows that it is approximately 10 times faster and has a wider operating range compared to standard scan matching methods. Disadvantages of the proposed method include the relatively rough resolution of the obtained transformation vectors, slightly higher relative error (approx. 5%), and the need to set a fixed resolution of the raster.

The paper "Providing Databases for Different Indoor Positioning Technologies: Pros and Cons of Magnetic Field and Wi-Fi Based Positioning" by J. Torres-Sospedra et al. describes a publicly available dataset collected by the authors that includes magnetometer data and Wi-Fi data. The paper, written in the spirit of modern open science, includes an elaborate and detailed description of the databases and also provides a comprehensive study of baseline results, making the databases all the more attractive as a benchmark platform for future research. The paper also compares the use of maps of Wi-Fi signal strength versus maps of magnetic field for indoor positioning, both of which are central technologies in present-day indoor positioning.

The paper entitled "Arm Motion Recognition and Exercise Coaching System for Remote Interaction" by H. Zeng et al. presents a system that recognizes hand gestures performed by a trainee during body exercise and compares these gestures with the ones performed by the trainer. The gesture recognition is based on data captured from sensors provided by a smartphone. Both the trainee and the trainer have to hold the smartphone in their hands during exercise. The authors argue that this system is easier to use because it does not require additional expensive devices such as a hand-worn wristwatch or wristband.

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