Editorial: Smart Objects and Technologies

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1 Editorial

Smart objects are entering everyday life and are heavily modifying it. Healthcare, communication, art, entertainment, safety, environment, education, democracy, and human rights are just a few examples of scenarios that are radically changing thanks to the use of smart objects and technologies.

In this context, the popularity of portable computing devices, such as smartphones, tablets, or smart watches combined with the emergence of many other small smart objects with computational, sensing and communication capabilities coupled with the popularity of social networks and new human-technology interaction paradigms is creating unprecedented opportunities for each of us to do something useful, ranging from a single person to the whole world. Furthermore, Internet of Things, Smart-cities, distributed sensing and Fog computing are representative examples of modern ICT paradigms that aim to describe a dynamic and globally cooperative infrastructure built upon objects intelligence and self-configuring capabilities. These connected objects are finding their way into our pockets, vehicles, urban areas and infrastructure, thus becoming the very texture of our society and providing us the possibility, but also the responsibility, to shape it.

This special issue features six selected high quality papers in the fields of 5G technology and use-cases, community networks, and artificial intelligence. The first article entitled “Privacy Perception when using Smartphone Applications” presents a study evidencing user privacy awareness when using smart appliances. The study is based on two questionnaires (within-subject experiments with 200 volunteers) and on the lists of installed apps (30 volunteers). Results show a

widespread abuse of data related to location, personal contacts, camera, Wi-Fi network list, running apps list, and vibration. An in-depth analysis shows that some features are more relevant to certain groups of users (e.g., adults are mainly worried about contacts and Wi-Fi connection lists; iOS users are sensitive to smartphone vibration; female participants are worried about possible misuse of the smartphone camera).

The second article entitled “The Contextual Ego Network P2P overlay for the next generation Social Networks” proposes a Decentralized Online Social Networks (DOSNs) approach aimed at guaranteeing more user control over private data. The work, undertaken in the HELIOS project, tackles this issue by introducing a new decentralized paradigm referred to as Contextual Ego Network (CEN), a new P2P Social Overlay built by exploiting the real life of users. The authors formally define the structure and the implementation of the network structure in a Java library, which can be easily included in an Android application.

In the next article entitled “A Cautionary Tale for Machine Learning Design: Why We Still Need Human-Assisted Big Data Analysis”, the authors present a study with the main goal to increase the accuracy of a Supervised Machine Learning (ML) system in predicting when a water meter would malfunction/need disassembly based on a history of water consumption measurements. The authors firstly trained a neural network using only samples that were not noised by data impurities, then, they enhanced the data semantics with the contribution of field experts. The study proved that a human-in-the-loop approach may significantly help to clean and re-organize noised datasets for an empowered ML design experience.

The fourth article entitled “Detecting vehicles’ relative position on two-lane highways through a smartphone-based video overtaking aid application” presents a smartphone-based real-time video overtaking architecture for vehicular networks. The application aims to prevent head-on collisions that might occur due to attempts to overtake when the view of the driver is obstructed by the presence of a larger vehicle ahead. In the presented scenario, ahead vehicles stream a video flow to the vehicle behind aiding the overtaking maneuver. The problem then becomes picking the right video source and

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destination among vehicles in close proximity, depending on their relative position on the road. To this end, different data fusion techniques are proposed and contrasted, evidencing their tradeoffs.

The fifth article, “Graph-Based Radio Resource Sharing Schemes for MTC in D2D-based 5G Networks” addresses the problem of co-existence of human-to-human (H2H) and machine-to-machine (M2M) communications in cellular networks. To this end, the authors propose some novel radio resource sharing algorithms capable of accommodating M2M communications while not severely degrading existing H2H services. The radio resource sharing problem is formulated as a sum-rate maximization for which the optimal solution is non-deterministic polynomial-time hard (NP-hard). Overcoming the computational complexity, several heuristics based on centralized and semi-centralized approaches are proposed and shown to effectively guarantee H2H performance in terms of throughput and fairness while maximizing the efficiency of M2M spectrum usage.

Immersive technology is expected to become a key player in the next wave of consumer electronics with potential applications spanning a wide variety of sectors. Yet, there are a number of technological hurdles which need to be addressed. In the last article entitled “Addressing the Bandwidth Demand of Immersive Applications through NFV in a 5G Network”, the authors focus their study on some functional building blocks that can be used in conjunction and deployed in a 5G virtualized architecture to alleviate bandwidth and latency requirements of immersive application scenarios. To this end, they present an experimental scenario exploiting real data to test our combined solution based on the field of view cut and optimized transport protocols, discussing the tradeoffs that emerge.

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