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Editorial

IoT Approaches for Distributed Computing

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21.000 million devices will be connected to the Internet by 2021, and 16.000 of them will be part of the Internet of Things (IoT). The usage of manifold connected sensors (temperature, humidity, pressure, vibration, air quality, etc.) in different fields (plants, animals, geological phenomena, cities, homes, etc.) will enable the collection of a vast amount of data subsequently transformed into information and knowledge. However, such a knowledge creation process cannot be handled in a totally centralized way and must be combined with distributed computing so that information transmitted is reduced by sharing the processing load among devices. In traditional distributed computing, shared processing is enabled by additional hardware architectures that have to satisfy higher processing capabilities while ensuring lower power consumption.

The distinct characteristics of IoT technologies require a more intricate trade-off communication versus computation. In particular, a large number of sensors and QoS strict requirements demand new distributed techniques. As the sensor volume grows, infrastructures for IoT distributed computing must include nodes close to the edge that facilitate data analysis for a cluster of sensors. They must also perform edge analytics to reduce the data sent to the core from high-frequency readings and decrease the bandwidth needed. Finally, they must guarantee that customer experience is not compromised, which requires new robust techniques with strict QoS and latency requirements. The emerging paradigm of fog computing enables us to meet these requirements by moving storage and compute services to the network edge or even to the end devices (e.g., to a data hub or to a smart access point).

This special issue aims to be a compendium of the latest development on IoT related to new abstraction or multiagent approaches to distribute tasks among edges and Cloud; new techniques and communication standards for sharing information to increase spectrum efficiency while keeping data consistency and availability; and new metadata, policies, and hardware/software capabilities to aid fog-orchestration in distributed databases.

The paper "Distributed Measurement Data Gathering about Moving Objects" presents techniques for the acquisition of data related to moving objects that reduces the resources consumed by communication tasks. The methods proposed use Fog computing and automated prediction and result in improved network traffic. These methods can enable efficient Internet of Things composed of moving vehicles with strict communication requirements.

The paper "*MeReg*: Managing Energy-SLA Tradeoff for Green Mobile Cloud Computing" proposes an adaptive heuristics energy-aware algorithm, which creates an upper CPU utilization threshold using recent CPU utilization history to detect overloaded hosts and dynamic VM selection algorithms to consolidate the VMs from overloaded or underloaded host. The algorithm tries to minimize total energy consumption and maximize Quality of Service, including the reduction of service level agreement (SLA) violations. The proposed solution contributes to reduce electrical energy consumption, which affects businesses using mobile cloud computing (MCC) as well as the environment through car-bon dioxide (CO2) emissions.

The paper "Distributed Image Compression Architecture over Wireless Multimedia Sensor Networks" describes techniques that improve the energy consumption for networks that obtain image signals. Specifically, the paper proposes techniques for distributed compression of images, optimal camera coverage design, and routing schemes for reduced transmission energy. The techniques proposed are of particular interest for emerging multimedia sensor networks since both the transmission of original multimedia signals and centralized compression require unaffordable energy consumption.

The paper "An Adaptive Joint Sparsity Recovery for Compressive Sensing Based EEG System" proposes a scheme to reduce the energy consumption associated with the transmission of data in IoT devices such as a wearable electroencephalogram (EEG). This scheme is based on Compressive Sensing (CS) EEG signal compression and recovery. The scheme exploits the joint sparsity of multichannel EEG signals and improves the reconstruction quality and efficiency of the system.

The paper "Using Emotions in Intelligent Virtual Environments: The EJaCalIVE Framework" proposes a framework for the creation of emotional virtual environments that incorporate agents, eHealth related devices, human actors, and emotions projecting them virtually and managing the interaction between all the elements. This framework allows the design and programming of intelligent virtual environments, as well as the simulation and detection of human emotions. The framework is also validated in a case study that simulates a residence for the elderly which enable the training of an assistance robot.

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