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IEEE Journal of Selected Topics in Signal Processing

Special Issue on Cooperative Signal Processing for Heterogeneous and Multi-Task Wireless Sensor Networks

Aims and Scope

Portable devices usually operate on their own to solve a single or multiple signal processing tasks in a non-cooperative fashion. To achieve superior performance without a dedicated and power-hungry central device, distributed and cooperative processing techniques over wireless sensor networks (WSNs) have received a lot of attention. However, traditional WSNs typically assume an homogeneous setting, in which the cooperation is limited to homogeneous devices that observe the same phenomenon and that are interested in solving a single network-wide signal processing task.

Due to the heterogeneity of the devices, which may belong to the so-called Internet-of-Things in today's digital age, there is a growing interest in system configurations that overcome the limitations of traditional WSNs. Toward this goal, these systems, referred to as heterogeneous and multi-task WSNs, generalize the homogeneous WSNs to settings, in which randomly located heterogeneous devices cooperate with each other although they observe different but overlapping phenomena, and are interested in solving different but related signal processing tasks. Since the cooperation takes place among devices that generate a large volume of data and that may have different observation models and targeted tasks, the algorithm design needs to address different new challenges of big data analytics to allow for a superior performance as compared to the case where the devices would operate on their own, or where they would exchange raw sensor data in an uncontrolled fashion. In particular, besides keeping minimal communication bandwidth and transmit power when solving the multiple tasks simultaneously, the new challenges require a novel theoretical framework for distributed detection, classification, estimation, coding and topology inference when the devices can have different goals (e.g., the estimation of signals with partially overlapping latent subspaces or detection of different but overlapping sets of events) and modes of operation (e.g., different sampling rates, image resolution). Moreover, as the devices may be selfish and/or malicious, new operating principles need to be designed in order to encourage cooperation and avoid selfish/malicious behavior.

This special issue covers the signal processing theory, modeling, algorithms, and implementation aspects related to heterogeneous multi-tasks WSNs and their use in various applications.

Topics of interest include (but are not limited to):

- Ad-hoc heterogeneous and multi-task wireless sensor networks (and applications thereof)
- Adaptive distributed learning over multi-task networks
- Multi-task decentralized and distributed optimization
- Big data analytics over distributed multi-task networks
- Multi-task distributed detection and labeling
- Distributed multi-task parameter and signal estimation
- Audio/speech or image processing over distributed multi-task networks
- Distributed localization and tracking over multi-task networks
- Distributed topology inference and control
- Cooperative communications over heterogeneous networks
- Game-theoretical tools for trust management and cooperation stimulation over multi-task networks

Important Dates:

- **Manuscript submission due:** ~~June 1, 2016~~ **June 15, 2016**
- **First review completed:** August 15, 2016
- **Second review completed:** December 1, 2016
- **Final manuscript due:** January 1, 2017
- **Revised manuscript due:** October 1, 2016
- **Publication date:** April 2017

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