Call for PhD candidate :

Subject : PhD vacancy in industrial IoT and cognitive networks at IMT Atlantique, France & Mid Sweden University, Sweden

Dear colleagues,

IMT Atlantique in Rennes, France, and Mid Sweden University in Sundsvall, Sweden, offer an opportunity for a co-tutelle PhD position in industrial IoT and cognitive networks.

Subject :

Self-Organizing Large Scale IoT Mesh Networks through Distributed Time Synchronization & Cognitive Coexistence

Description :

The Internet of things (IoT) industry is expanding faster than ever, increasing the number of connected devices by short-range radio technologies (e.g., Zigbee, Bluetooth, WiFi) to an estimated volume of 20.6 billion devices by 2026 (Ericsson Mobility Report, Nov. 2020). A prominent factor in this growth is the license-free Industrial, Scientific, and Medical (ISM) frequency bands, which are harmonized worldwide for deploying independent networks without licensing. As a result, this growth is not only increasing the number of IoT systems but also the size of systems to support smart applications and their coexistence/interference scenarios in the same environment. Supporting large-scale wireless mesh IoT networks with interference awareness, while not compromising important performance metrics like throughput, latency, and current consumptions, is key to meet the emerging connectivity demands of smart spaces (e.g., offices, industries).

One of the favorite channel access methods for IoT used in smart commercial or industrial buildings is Time Slotted Channel Hopping (TSCH)-enable mesh networks. TSCH enables the robustness of IoT networks against interference by implementing Adaptive Frequency Hopping (AFH), both being integral to operate in crowded license-free frequency bands. However, TSCH technology requires accurate network-wide time synchronization for synchronous AFH, which becomes a challenge with network size/scale. Apart from AFH, time synchronization is central to executing distributed control and sensing for the underlying applications (e.g., data fusion, event localization). Meanwhile, AFH requires intelligence on coexisting technologies; estimation and prediction of spectral footprints in time, frequency, and space domain of RF interference play a vital role in increasing the robustness and dependability of TSCH systems by blacklisting the interfered radio resources. In this context, this project will contribute towards designing dependable large-scale low-power wireless mesh networks, with two crucial research elements on establishing and maintaining such networks as:

- Developing scalable and accurate distributed time synchronization schemes for expanding IoT systems.

- Instead of a statistical model for existing reactive AFH schemes, developing proactive AFH, based on radio-map generation with interference detection and learning, to increase reliability and ability to coexist with other IoT systems.

Keywords :

IoT, Industrial Networks, Industrial IoT, Mesh Networks, Wireless Networks, Time Synchronization, Cognitive Networks.

Environment :

The candidate will work at the SRCD department of IMT Atlantique, Rennes (the first two years), and at the STC research center of Mid Sweden University in Sundsvall (the last two years). The working language will be English. The expected startup date is November 1, 2021, but may however be flexible.

Required competence for the applicant :

- Signal processing, especially detection and estimation theory for developing clock offset and skew estimators, and interference detection, inference, and radio maps generation.
- Applied mathematics and optimization for clock stability analysis and parameter optimization.
- Embedded system programming for developing and demonstrating the developed components as a system.
- Good understanding of IoT protocol stacks, PHY/MAC layers, and real-time operating systems (e.g., Contiki, FreeRTOS, TinyOS).

How to apply and/or get further information :

Applicants must submit an official academic transcript of records for their bachelor and masters education. It is a requirement to hold a masters or an equivalent degree for being considered for this position. At least two references (name, position, e-mail, and telephone number) should be included in the application. Candidates should send by e-mail a CV and a statement of purpose to:

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It will be greatly appreciated if you forward this position to whomever might be interested.

We are looking forward to strong applications.

Stay safe,

Georgios