Avis de soutenance de thèse

Mme **Fatima SALAHDINE**

Soutiendra sa thèse pour obtenir le grade de Docteur

de l'Institut National des Postes et Télécommunications

Le Vendredi 19 janvier 2018 à 15h00 à l'amphithéâtre de l'INPT.

Sujet de thèse :

« Compressive Spectrum Sensing for Cognitive Radio Networks »

Devant le jury :

M. DRISSI M'hamed, PES, Directeur de l'ENSA de Rennes (Président) ;

M. EL ABBADI Jamal, PES, EMI, Rabat (Rapporteur) ;

M. AZAMI Nawfal, PES, INPT, Rabat (Rapporteur) ;

M. EL BOUANANI Faissal, PH, ENSIAS, Rabat (Rapporteur) ;

M. AHOUZI Ismail, PES, INPT, Rabat (Examinateur) ;

M. ABOU EL MAJD Badr, PH, FSR, Rabat (Examinateur) ;

M. EL GHAZI Hassan, PH, INPT, Rabat (Supervisor) ;

Mme KAABOUCH Naima, Full Professor, University of North Dakota, USA (Co-Supervisor).

Résumé:

Wireless networks and information traffic have grown exponentially over the last decade, which resulted in an excessive demand for the radio spectrum resources. The classical spectrum assignment policy consists of assigning the spectrum to specific users with licenses for specific services. Those spectrum owners have the access to this spectrum to transmit their data. Moreover, recent measurements reported that the spectrum is underutilized, which requires a great solution to overcome the spectrum utilization and management problem. Opportunistic spectrum access (OSA) has been proposed to solve the spectrum management problem and avoid the spectrum waste over the network. It permits to share the spectrum between PUs and SUs without harming PUs' priorities. Cognitive radio is proposed to advance the use of OSA and allow SUs to use the spectrum when it is free using spectrum detection techniques.

Cognitive radio systems can observe and learn from their environment to use the spectrum more efficiently. They are aware of what is going on in the radio environment and they can dynamically adjust their parameters according to these conditions. They perform the sensing to identify the available channels to use them for their transmission without interfering with the PUs' transmission. One of the main challenges of cognitive radio network is the wideband spectrum sensing. Existing spectrum sensing techniques are based on a set of observations sampled by an ADC at the Nyquist rate. However, those techniques can sense only one channel at a time because of the hardware limitations on the sampling rate. In addition, in order to sense a wideband spectrum, the wide band is divided into narrow bands or multiple frequency bands. SUs are required to sense each band using multiple RF frontends simultaneously, which can result in a very high processing time, hardware cost, and computational complexity. In order to overcome these problems, the signal sampling should be as fast as possible even with high dimensional signals. Compressive sensing has been proposed as a low-cost solution to reduce the processing time and accelerate the channels scanning process.

In this dissertation, we aim to develop efficient and fast compressive sensing techniques to improve the radio spectrum detection over time using software defined radio (SDR). Our proposed techniques were implemented and extensively tested. Their results were compared to the existing techniques based on a number of metrics. As a conclusion, with compressive sensing, the radio spectrum scanning is faster and its efficiency is improved.