Proposition de recherche doctorale

Nouveaux paradigmes mathématiques pour la vie connectée

Mots clés :

- Directeur de thèse : LAURENT DECREUSEFOND
- Co-encadrant(s) :
- Unité de recherche : Laboratoire Traitement et Communication de l'Information
- Ecole doctorale : École Doctorale Informatique, Télécommunications, Électronique de Paris
- Domaine scientifique principal: Divers

Résumé du projet de recherche (Langue 1)

Within 2020, the number of connected devices is going to explode from 9 billions to 24 billions. The foreseen heterogeneity of terminals, technologies, protocols, energetical and security constraints urges us to develop new paradigms for the forecasting and performance evaluation of these systems. As they are all based on radio communications, path-loss and interference are the main factors limiting their capacity. It is thus of paramount importance to have mathematical models reflecting the respective positions of resources and/or customers. Up to now, the classical model consists in deterministic deployment of base stations in cellular systems. It is only very recently that Poisson point processes have been considered as alternative models. Actually, no models are envisioned for terminals, sensors, etc. Moreover, the Poisson point process, despite its undoubtable mathematical tractability, does not fit well with the reality as it does not take into account the expected dependence between positions. On the other hand, determinantal and permanantal processes are genuinely built to represent correlated positions. These processes are thus appealing candidates for the modeling of all the terminals involved in connected life. We have some knowledge about their mathematical properties and it is now time to focus on their applicability as modeling tools to wireless networks.

Résumé du projet de recherche (Langue 2)

Our goal is 1) to construct statistical tools to determine the true nature of a real-life configuration (repulsive, attractive, neutral), 2) to realize a taxonomy of point processes in view of their usage: which model is convenient for terminals around hot-spot, for femtocells access in a building, for base stations in a district, etc. 3) to compare some of the performance (like interference field, coverage properties) of wireless networks according to the different possible scenarios, 4) to pursue the stochastic analysis of determinantal and permanantal point processes, with a particular view towards functional inequalities which are becoming more and more useful in applications.

Informations complémentaires (Langue 1)

Une collaboration est envisagée avec N. Privault, expert reconnu en processus ponctuel, professeur à l'Université de Singapour. Des séjours de plusieurs semaines par an à Singapour seront organisés de manière à fluidifier la collaboration.