Informatics Research
Institute of Toulouse

Monday 16 April 2018
14h00 – 15h30
INP-ENSEEIHT, Salle des thèses

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A polarization framework for bivariate signal processing

Seminar

Keywords: bivariate signals, polarization, spectral analysis, time-frequency analysis, quaternion Fourier transform

Abstract: Bivariate signals appear in a broad range of applications: polarized waveforms in seismology and optics, current velocities in oceanography, etc. Formally, bivariate signals are 2D vector time series. Existing approaches for bivariate signal processing do not provide a straightforward description of the signal in terms of its polarization properties. For this purpose we introduce a new and generic framework for processing bivariate signals. It is based on a tailored quaternion Fourier transform enabling the generalization of usual signal processing quantities such as spectral densities, analytic signals or spectrograms. This new framework re-establishes a clear interpretability in terms of polarization attributes and provides new avenues for bivariate signal processing. In this talk, I will introduce the main features of this approach and illustrate its usefulness on synthetic and real-world data from geophysics and gravitational wave physics.

Bio: Julien Flamant obtained his M.Sc degree in Electrical Engineering and applied Physics from Ecole Normale Supérieure de Cachan, France in 2014. He completed his M.Phil degree in Electrical Engineering from The University of Melbourne in 2016. He is currently pursuing his PhD studies at CRIStAL, Lille, France, under the supervision of Pierre Chainais and Nicolas Le Bihan. His research interests are centered around signal processing theory and methods and their applications in physics.

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