Colloquium d'Informatique de l'UPMC Sorbonne Universités

« Chirps » everywhere

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« Chirps »—i.e., transient waveforms that are modulated in both amplitude and frequency—are ubiquitous in Nature. Birds are chirping, bats and whales too, and even coalescing black holes are, as it has been recently evidenced by the first direct detection of gravitational waves. Chirps can also be found in some mathematical functions (such as Riemann's) and they are extensively used in engineering (active radar and sonar, non-destructive evaluation).
Because of their highly nonstationary structure, chirps call for description tools that go beyond Fourier, with « time-frequency » as a natural paradigm for their analysis and processing. Basics of such approaches will be first recalled and complemented by recent advances aimed at adaptively disentangling multicomponent chirp signals into coherent constitutive waveforms. Two case studies will then be detailed, dealing namely with the bat biosonar system and the interferometric detection of gravitational waves.

Patrick Flandrin received the « Docteur d'État » degree from INP Grenoble, France in 1987. He joined CNRS in 1982, where he is currently Research Director. Since 1991, he has been with the « Signals, Systems and Physics » Group, within the Physics Department at ENS de Lyon, France. He is currently President of GRETSI, the French Association for Signal and Image Processing. His research interests include mainly nonstationary signal processing (with emphasis on time-frequency and time-scale methods), scaling stochastic processes and complex systems. He published over 250 research papers and authored one monograph in those areas.
Dr. Flandrin was awarded the Philip Morris Scientific Prize in Mathematics (1991), the SPIE Wavelet Pioneer Award (2001), the Prix Michel Monpetit from the French Academy of Sciences (2001) and the Silver Medal from CNRS (2010). Past Distinguished Lecturer of the IEEE Signal Processing Society (2010-2011), he is a Fellow of the IEEE (2002) and of EURASIP (2009), and he has been elected member of the French Academy of sciences in 2010.

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