

# SÉMINAIRE DU GROUPE AUTOMATIQUE



Conférence de M. Stéphane Victor

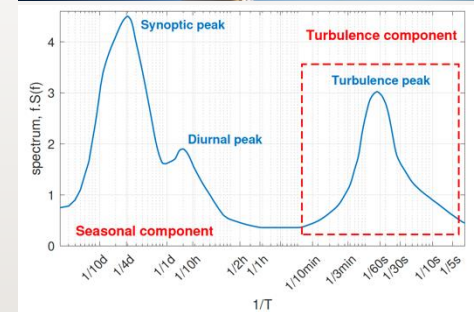
JEUDI 14 NOVEMBRE 2024

DE 16H30 À 17H30

SALLE DES CONFÉRENCES

## Wind speed turbulence system identification and signal generator

The objective of this talk is to propose a realistic wind turbulence simulator, especially in the case of mechanical systems operating outdoors such as tracking antennas or wind powers. Wind turbulence is a stochastic and non-stationary process corresponding to the short-term component of wind and therefore is difficult to model in time domain. Wind spectral characteristics are described by the power spectral density whose approximation is used in the real-time simulator to reproduce wind behavior. The von Karman model is the most commonly used model to approximate the power spectral density of wind turbulence. However, this model was originally designed for aircraft, and therefore for high altitudes and moving systems. In our case, tracking antennas are used under different conditions: low altitude and slow moving systems. This makes the von Karman model less precise in middle and high range frequency. Consequently, there is a need in more accurately modeling wind turbulence under these specific conditions. As von Karman's model expression uses fractional calculus, other fractional models are investigated and designed with the same input conditions (mean speed, standard deviation and length scale) as the von Karman model. Moreover physical meaning is also provided to the proposed model parameters in order to easily tune them for realistic wind turbulence scenarios. Finally, an accurate turbulence wind speed generator is proposed.



**Stéphane VICTOR** was born in Germany in 1983. He graduated from ENSEIRB and Ecole Polytechnique de Montréal engineering schools in 2006, and obtained his MSc and PhD degrees in Automatic control from Université de Bordeaux in 2006 and 2010, respectively. He received his Accreditation to supervise research (HDR) from Univ. Bordeaux in 2022. His research interests are mainly in fractional calculus and fractional systems in automatic control, modeling and system identification, motion/trajectory planning, flatness and robust control. The applications are mainly on thermal System (Health&Biomedical (lungs), Climate Change, Heat Conduction, Atmosphere Reentry), Robotics (UAV, Autonomous car, Autonomous Tractor, Mobile Antenna) and other applications (Turbofan Control, Machining modeling and Control, Wind Turbulence,...)

