

PhD Position

Watowa: Wavelet-to-wavelet propagation for long-range propagation in varying atmosphere.

ENAC: French National University of Civil Aviation

General Information

Locations:

French National University of Civil Aviation (ENAC), Toulouse, France

Civil Aviation University of China (ENAC), Tianjin, China

Supervision: Rémi Douvenot and Alexandre Chabory (ENAC)

Funding: ENAC and DGA (Ministry of Defence)

Starting Date: between September and December 2020

Duration: 3 years

Candidate Profile: Engineering student / Master 2 in Electric Engineering. Skills in Radiowave propagation and/or signal processing

Context

Modelling the long-range propagation is of great importance for many applications, including surveillance (radar), communication (satellite TV), geoscience (radio-occultation), and navigation (GNSS).

One of the most used method for such modellings is the parabolic equation method. Based on a split-step Fourier algorithm (SSF) and performs well for modelling 2D scenes. However, when large number of computations are required, faster methods would be appreciate.

These last years, a 2D propagation method based on a wavelet decomposition has been developed by Hang Zhou [1] under the supervision of Rémi Douvenot and Alexandre Chabory at ENAC. This method is based on alternative steps in the wavelet domain and in the space domain. In the absence of relief, preliminary studies show that the propagation could be considered entirely in the wavelet domain.

Objectives

The aim of this PhD is to develop the wavelet-to-wavelet (watowa) propagation technique. Several questions are still open. The error modeling of the atmosphere due to the spatial spreading of the wavelet must be evaluated. Moreover, closed-form expressions for the wavelet propagation could improve the speed and accuracy of the technique. Efficient hybridization with split-step wavelet must be explored for accounting the relief. Finally, the interest of wavelets for propagation in a turbulent media should be explored.

Applying

Candidates should demonstrate skills in one or more of the following fields: electromagnetic propagation, signal processing, numerical simulations. A good English level and good writing skills are also requested.

Interested candidates should send their CV via e-mail, accompanied by a cover letter, and the names and email addresses of three referees to:

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Deadline for applying the 10 March 2020

Bibliography

- [1] H. Zhou, R. Douvenot, and A. Chabory, "Modeling the long-range wave propagation by a split-step wavelet method," *Journal of Computational Physics*, vol. 402, p. 109042, 2020. [Online]. Available: <http://www.sciencedirect.com/science/article/pii/S002199911930748X>