Internship offer
Variational Bayes phase tracking

Research group: ComIT

Location: ISAE-SUPAERO, 10 avenue Édouard Belin, 31400 Toulouse.

Duration: 5-6 months beginning ca. February-April 2022.

Gratification: 3.9 €/hour cf. service-public.fr

1 Research topic

In many fields of engineering, estimating the carrier phase of a signal plays a major role. For instance, for GNSS (Global Navigation Satellite Systems) the phase allows for a precise positioning.

The research group ComIT has recently designed an algorithm to track the phase of a signal while using a so-called variational Bayes (VB) approximation injected in the optimal Bayes filtering problem [1–3]. Performance is very encouraging ; particularly the VB algorithm is highly robust to cycle slips (an estimation error of a multiple of 2π) compared to concurrent methods.

In this internship, we want to investigate some extensions to the VB algorithm to address a wider range of practical scenarios.

The main stages are:

1. State-of-the-art;

2. Reproducing results from [1, 2];

3. Extending the VB algorithm (several possibilities to discuss with the advisor) and comparison with conventional techniques (e.g., Kalman filter) ;

4. Writting the manuscript.

The intern will frequently meet with the advisor and report his/her progress via short technical reports. If time and results allow, writing a scientific paper (conference, letter, etc.) will be encouraged.

2 Qualifications

- Final year degree student (Master of Science, Master of Research)

- Fields: statistical signal processing (including estimation batch and/or recursive)

- Quality: motivation and rigorousness

- Main tools: Matlab, LaTeX

3 Application procedure

If this research topic is of interest to you, please send a resume, a letter of motivation and your academic transcript to Stéphanie Bidon, `<stephanie.bidon@isae-supaero.fr>`.

References

[1] Fabio Fabozzi, Stéphanie Bidon, and Stébastien Roche. Robust estimation of high-order phase dynamics using variational bayes inference. In *Proceedings IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, virtual, 2021.

[2] Fabio Fabozzi, Stéphanie Bidon, Stébastien Roche, and Benoît Priot. Robust gnss phase tracking in case of slow dynamics using variational Bayes inference. In *Proceedings IEEE/ION Position, Location and Navigation Symposium (PLANS)*, pages 1189–1195, Portland, OR, 2020.

[3] V. Smídl and A. Quinn. Variational Bayes filtering. *IEEE Transactions on Signal Processing*, 56(10):5020–5030, October 2008.