

Maximum-Likelihood Estimation of Beat Signal Parameters in Automotive Radar



TECHNISCHE
UNIVERSITÄT
DARMSTADT

Bachelor thesis or Master thesis

Topics: sensor array processing, automotive radar signal processing, maximum-likelihood estimation

Description

Conventional FMCW radar systems operate across coarse Doppler and range bins to estimate target parameters, which can be inaccurate for targets with similar range-Doppler-azimuth signatures. Leveraging the sparsity of beat signals in the time-frequency-beamspace representation of the measurement data, we present a sequential algorithm for jointly estimating the polynomial coefficients and azimuth directions of multiple beat signals.[1], [2], [3], [4]

Familiarity with the following topics can be beneficial

- Linear algebra
- Python, Latex

The thesis and presentation will be in English. The supervision can be in German or English.

Please contact Kaleb Debre (✉ kaleb.debre@tu-darmstadt.de), if you are interested.

References

- [1] M. A. Richards, *Fundamentals of Radar Signal Processing*, 2nd ed. New York: McGraw-Hill education, 2014, ISBN: 978-0-07-179832-7.
- [2] K. Debre, T. Fei, and M. Pesavento, *Sequential Maximum-Likelihood Estimation of Wideband Polynomial-Phase Signals on Sensor Array*, arXiv:2412.20975, Jan. 2025. doi: 10.48550/ARXIV.2412.20975. Accessed: Jan. 7, 2025.
- [3] A. Gershman, M. Pesavento, and M. Amin, "Estimating parameters of multiple wideband polynomial-phase sources in sensor arrays," *IEEE Transactions on Signal Processing*, vol. 49, no. 12, pp. 2924–2934, Dec. 2001, ISSN: 1053587X. doi: 10.1109/78.969501. Accessed: Feb. 24, 2023.
- [4] A. M. Zoubir, Ed., *Academic Press Library in Signal Processing, Vol. 3, Array and Statistical Signal Processing. Volume 3. Array and Statistical Signal Processing* (Academic Press Library in Signal Processing volume 3), First edition. Kidlington, Oxford: Academic Press, 2014, ISBN: 978-0-12-411597-2 978-0-12-411621-4.

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For other current thesis topics, feel free to visit the **virtual office hour** of Prof. Pesavento on Mondays, 16:00-17:00.

[Office Hour Link](#)

