JINGMING ZHANG

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☺ABOUT ME

- ***Outstanding academic performance*** & a ***solid foundation in mathematics and signal processing***
- ***Comprehensive understanding of model-based signal processing methods***, including linear filtering & prediction, Kalman filtering, adaptive filtering, spectral estimation, array signal processing, and time-frequency analysis
- ***Participated in various research projects*** funded by the Natural Science Foundation of China and the Youth Innovation Promotion Association, CAS
- **Research Areas:** *array signal processing and sparse signal processing*, with particular emphasis on *wideband array signal processing* algorithms based on *compressed sensing* and their *efficient implementation*

🎓EDUCATION

University of Chinese Academy of Sciences, Beijing, China Sept. 2022 - June 2025

M.Eng. in Signal and Information Processing (GPA: 3.93/4.00)
Supervisor: Prof. Chaohuan Hou and Prof. Chengpeng Hao
Thesis title: High-resolution Parameter Estimation for Wideband Signals Based on Gridless Compressive Sensing

Hohai University, Nanjing, China Sept. 2018 - June 2022

B.Eng. in Electronic Science and Technology (GPA: 4.8/5.0)
Core modules: Signals and Linear Systems, Digital Signal Processing, Electromagnetic Fields and Waves, Solid-state Physics, Analysis and Design of Digital Integrated Circuits, Analysis and Design of Analog Integrated Circuits

🖉RESEARCH EXPERIENCE

Graduate Student July 2023 - June 2025
Institute of Acoustics, Chinese Academy of Sciences Beijing, China

- *Gridless wideband joint elevation-azimuth angle estimation based on multiple frequency model*
  To achieve **gridless joint elevation-azimuth angle estimation** of **wideband signals**, an algorithm based on **atomic norm minimization** theory is proposed. To reduce computational complexity, two **fast implementation algorithms** based on **decoupling** and **eliminating redundant information** are proposed. Theoretical analysis and numerical simulations demonstrate the superiority of the proposed algorithms.
- *Joint angle-range estimation for the wideband sonar based on atomic norm minimization*
  In order to achieve two-dimensional localization with wideband sonar, the **joint angle-range estimation** for **wideband LFM** pulse sonar was studied. Based on the **atomic norm minimization** theory, **gridless** joint angle-range estimation algorithms were proposed for both single-pulse and multi-pulse scenarios. Simulation results showed that the proposed gridless algorithms can effectively **suppress** the impact of **aliasing**. Furthermore, since they are not affected by grid mismatch, they outperform the grid-based algorithms at high SNRs. The proposed multi-pulse algorithm successfully **eliminates** the influence of **range migration**, achieves **coherent accumulation** across multiple pulses, and performs better than the single-pulse algorithm, especially at low SNRs.
- *Joint angle-velocity estimation for the wideband sonar based on compressed sensing*
  In order to distinguish between targets, reverberation, and interference, the problem of **joint angle-velocity estimation** for **wideband LFM** pulse sonars was studied. **Grid-based** and **gridless** joint angle-velocity estimation methods were proposed based on the **multi-dictionary SBL** method and **atomic norm minimization** method, respectively. Furthermore, by introducing the **special structure** brought about by **range information**, an ANM method that considers range information was proposed. Simulation results show that compared to traditional algorithms, the proposed algorithms can all **suppress** the effects of **angle aliasing** and **velocity ambiguity**. Since they are not affected by grid mismatch, both gridless methods outperform the grid-based method when the SNR is sufficiently high. In particular, due to the utilization of the structure provided by range information, the ANM method that considers range information demonstrates better robustness and accuracy than the ANM method that ignores range information.
- *Fast constrained area DOA estimation based on atomic norm minimization*
  When the region of the DOA is known, the algorithm **complexity** can be **reduced** by searching for DOAs only within a constrained area. To achieve **gridless DOA estimation** and make full use of the **prior information**

about the DOA region, an area-constrained DOA estimation algorithm based on atomic norm minimization was proposed. Furthermore, a **fast implementation** algorithm based on the **primal-dual interior-point method** was developed. Theoretical analysis and numerical simulations demonstrated the superiority of the proposed algorithms.

Undergraduate Research Dec. 2021 - June 2022

Hohai University Nanjing, China

- *Theoretical and experimental research of thin plate inspection based on Lamb waves*
  - Investigated the dispersion phenomenon of Lamb waves and developed a **numerical method** for solving the **dispersion curve** based on the **dichotomy method**
  - Carried out **frequency domain** and **transient simulations** based on the finite-element method using **COMSOL** to investigate the **theoretical wave structure** and **detection performance** of Lamb waves
  - Proposed a **damage localization** method based on the **group velocity** of Lamb waves and **STFT**
  - **Conducted experiments** to investigate the detection performance of Lamb waves in practical situations

PROJECTS

Research on Multi-static Inverse Synthetic Aperture Sonar Waveform Design and Imaging

(Funded by the Natural Science Foundation of China) July 2023 - Dec. 2024

- Collaborated with labmates to conduct experiments on Qiandao Lake in Hangzhou, China
- Wrote the experiment reports and preprocessed the experimental data
- Developed DOA estimation algorithms and tested them on the experimental data

Integrated detection and tracking technology for weak targets detection Oct. 2024 - Dec. 2024

(Funded by Institute of Acoustics, CAS)

- Collaborated with labmates in organizing and summarizing project results
- Drafted the project report

PUBLICATIONS & PATENTS

Journal Articles

[1] **J. Zhang**, M. Wu, C. Hao and Y. Wu, "Wideband Joint Elevation-Azimuth Angle Estimation Based on Multiple Frequency Model and Atomic Norm Minimization," in IEEE Transactions on Instrumentation and Measurement, vol. 74, pp. 1-18, 2025, Art no. 6503918, doi: 10.1109/TIM.2025.3556225.

[2] **J. Zhang**, M. Wu, C. Hao, Y. Gao, et al, "Fast constrained area DOA estimation based on atomic norm minimization (in Chinese)， " accepted by ACTA ACUSTICA, Chinese version.

Conference Proceedings

[1] **J. Zhang**, M. Wu, C. Hao and D. Xu, "Wideband Joint Elevation-Azimuth Angle Estimation Based on Multiple Frequency Model and Atomic Norm Minimization," 2024 IEEE-APS Topical Conference on Antennas and Propagation in Wireless Communications (APWC), Lisbon, Portugal, 2024, pp. 24-29, doi: 10.1109/APWC61918.2024.10701980.

[2] **J. Zhang**, M. Wu, C. Hao and Y. Wu, "Joint Angle-Velocity estimation of wideband sonar based on multiple dictionary SBL algorithm (in Chinese)," 2024 the 18th National Conference on Signal and Intelligent Information Processing and Application, Hefei, China, 2024, pp. 157-162, doi: 10.26914/c.cnkihy.2024.050370.

Patents

5 China Patents (2 Granted)

SKILLS

- **Programming**: MATLAB, Verilog HDL, Python, C, LaTeX
- **EDA Tools**: Altium Designer, VIVADO, Cadence Virtuoso, Multisim
- **Modeling & Simulation**: Bellhop, COMSOL