Project proposal

Abstract

Direction-of-Arrival (DOA) estimation is an important research branch in array signal processing, which aims to find or distinguish the incoming directions of single/multiple propagating waves. The input signals are generally collected by sensor or antenna array. Multiple algorithms have been proposed for effective and robust direction estimation, including algorithms that develop a spatial spectrum by designing a filter banks, like CAPON[1] and subspace-based algorithms such as MUSIC[2], and maximum likelihood (ML)-based algorithms such as deterministic maximum likelihood(DML) and stochastic maximum likelihood(SML)[3]. All these aforementioned algorithms utilize the statistical properties of the source signal and can provide high accuracy when large amount of signal samples are available. However, when multiple sources are correlated, these algorithms tend to suffer from performance degradation. In [4], it is shown that the DOA estimation problem can be formulated as a sparse recovery problem, which provided some insight on handling strongly correlated sources. In [5], the proposed algorithm L1-SVD can achieve good performance when the number of correlated sources is known. In [6], a mixed L2-norm approximation method was proposed to handle coherent signals when the number of sources is unknown. Another method based on sparse representation of array covariance vectors (SRACV) provided in [7] to handle coherent signals (sources).

This project aims to comprehensively understand the methodology of sparse representation and recovery based DOA approaches and re-evaluate the performance (repeat their simulation experiment) of the L2-norm approximation method proposed in [6].

Milestones & Timeline

- ✧ Collect materials and relevant papers to understand the basics of sparse recovery based DOA approaches Apr. 02
- ✧ Fully understand the mixed L2-norm approximation method of [6] and finish initial report depicting the details of the corresponding methodology Apr. 16
- ✧ Repeat the simulation experiment in [6] and do testify the effectiveness of the original scheme; Start writing final report draft Apr. 23
- ✧ Summarize the work by Power Point and final report Apr. 30
- ✧ Final report, codes and simulation results submission May 07

Team Members

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References

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