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Recent research interests

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Here we briefly mention some of our recent work in the last few years, and list recent papers which can be downloaded from IEEE explorer.

Some of our recent publications develop new sparse arrays which are robust to mutual coupling. This is achieved by constraining the arrays such that adjacent sensors are separated by twice the half-wavelength or more. The challenge addressed is, how to design such sparse arrays without creating ambiguity in DOA estimation. We have developed many arrays that can achieve this while at the sample time identifying $O(N^2)$ source directions with a N-sensor array. We also published interesting work on **rational** sensor arrays for DOA estimation. In a traditional linear array, the sensor positions are integer multiplies of the half-wavelength $\lambda/2$. But in a rational array, they are allowed to be rational multiples of $\lambda/2$, that is, of the form $(p_i/q_i)\lambda/2$ where p_i and q_i are coprime integers. A number of advantages of this generalization have been found. Rational arrays also open up some interesting theoretical possibilities and lead to elegant theorems on DOA identifiability, in addition to offering practical advantages. These are discussed in detail in some of the listed papers. Another recent work is on the **denoising** of periodic signals. We have found that the use of Ramanujan *analysis* filter banks, followed by the use of *synthesis dictionaries*, rather than *synthesis* filter banks, results in an elegant and comeptitive way to denoise signals which have integer periodicity.

In recent times we also got interested in **distributed computing** for array processing. Thus we have shown that many standard algorithms in array processing can be implemented in a distributed manner without losing their normal perfomance guarantees. Yet another recent area is the implementation of **convolutional beam space** (CBS) algorithms in the presence of **RF chain** (radio-frequency chain) constraints. In recent years there has been considerable interest in the use of large arrays for mmWave signals. In such cases it becomes very difficult to use as many RF chains as the number of sensors. We have shown how to implement CBS algorithms using a hybrid approach where analog and digital processing are combined in order to reduce RF chains. In this set up, we have also shown how nonuniform sampling followed by coarray processing can significantly improve the number of identifiable DOAs. This combination of hybrid CBS, non uniform sampling, and coarray approach can also be used for mmWave **channel identification**, and has significant advantages.

Finally our work on graph signal processing has also continued, with some very interesting results on joint vertex-time filtering on graphs, and random node-asynchronous graph computations.

We hope you find the listed papers interesting!

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