POLARIZATION SENSITIVE ARRAY RECONFIGURATION METHOD BASED ON ANTENNA SELECTION FOR GNSS INTERFERENCE SUPPRESSION

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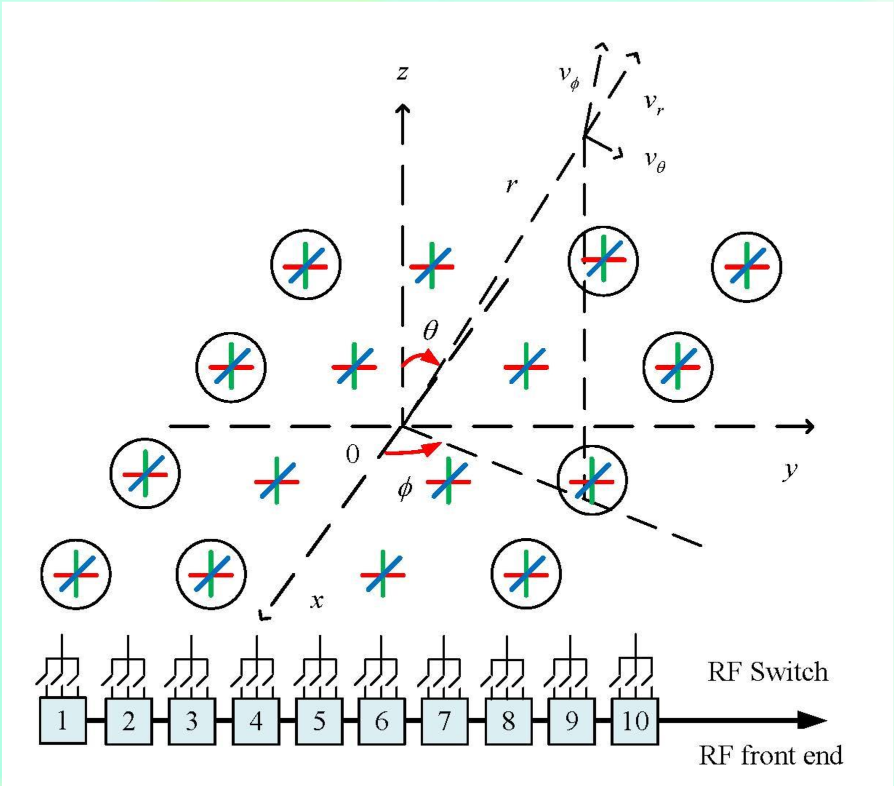
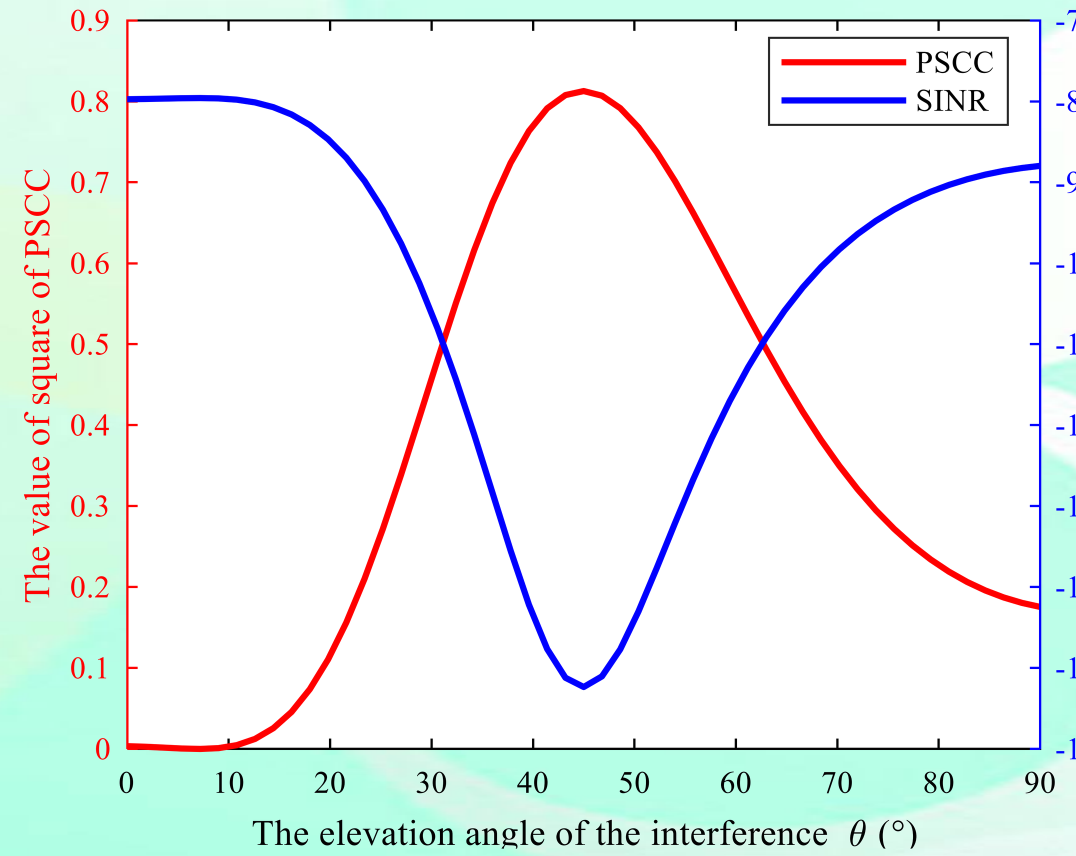
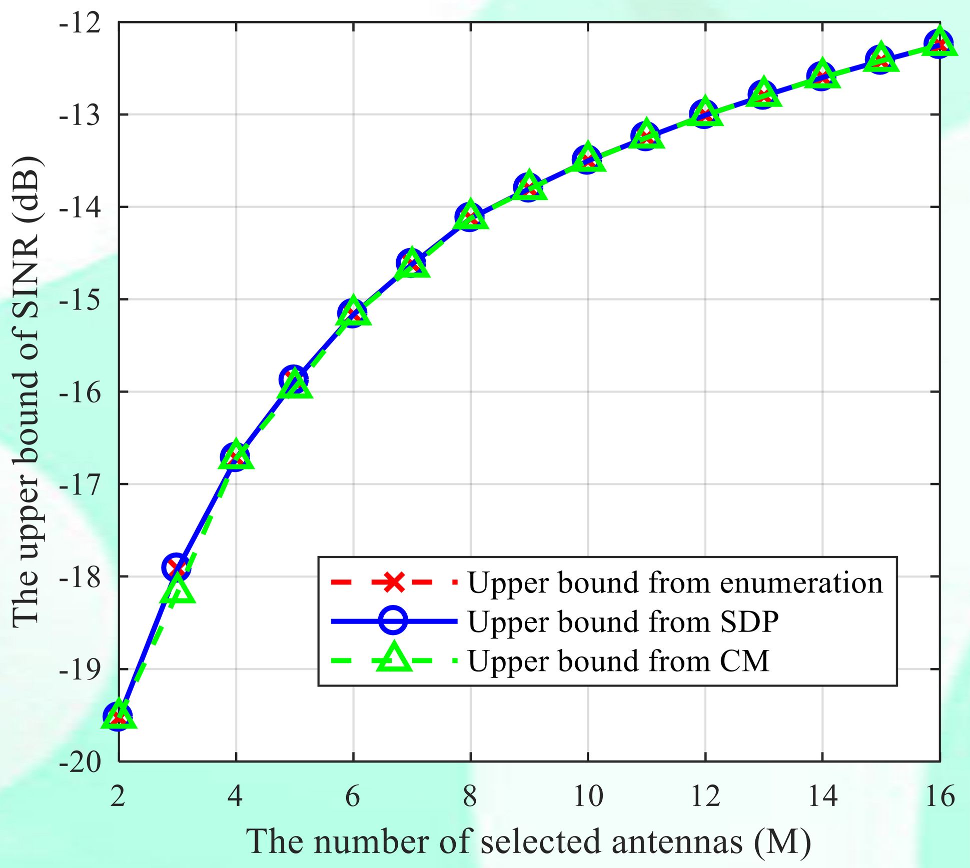
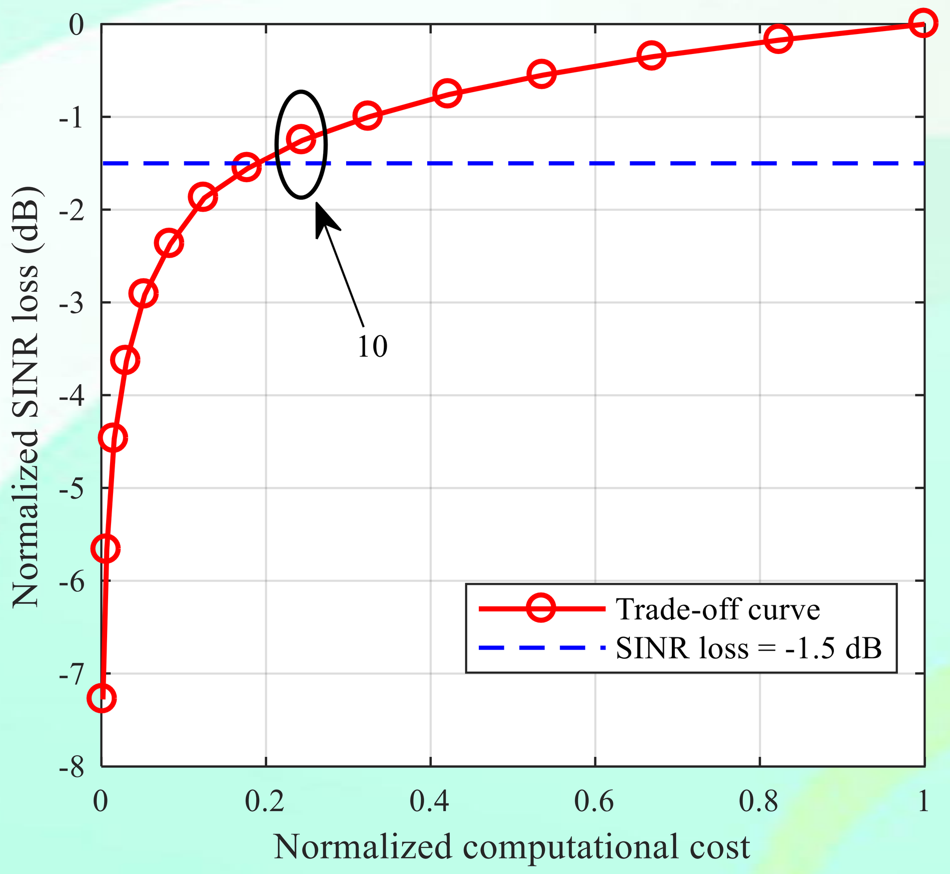
Index Terms — Polarization sensitive array reconfiguration, polarization-spatial correlation coefficient, antenna selection, optimization method, interference suppression.

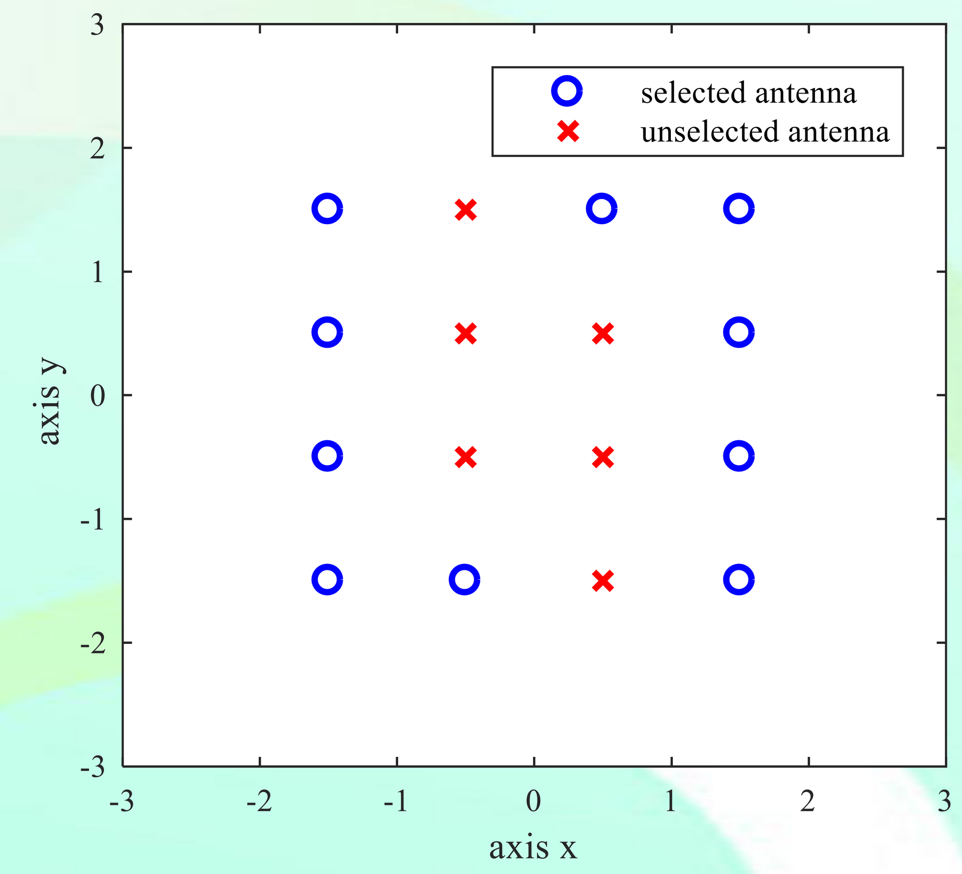
Polarization-sensitive array (PSA) has been widely used in global navigation satellite system (GNSS) applications for interference rejection. However, traditional PSA configuration where each antenna fixedly connects with two or more radio frequency (RF) front ends can result in large computational complexity and even redundancy in performance. In order to achieve a high signal to interference plus noise ratio (SINR) with fewer antennas and RF front ends, A PSA reconfiguration strategy based on antenna selection was proposed in this paper. Firstly, the SINR of Minimum Variance Distortionless Response (MVDR) beamformer of PSA under single interference is formulated and taken as an indicator to measure anti-interference performance. Subsequently, the polarization-spatial correlation coefficient (PSCC), is proposed to describe the degree of separation between desired signal and interference in the polarization-spatial domain. Then we derive the relational expression of SINR and PSCC, and analyze the impact of array reconfiguration on PSA performance. Aiming at maximizing the SINR of reconstructed PSA, we calculate the upper bounds of SINR under different numbers of antennas and plot the curve between computational cost and SINR loss to guide the selection of antenna quantity. Since the optimization problem is non-convex, we present two approaches to solve it more efficiently, instead of by enumeration. In the end, the PSA reconfiguration is performed by controlling the states of RF switches, and the selected antennas and corresponding RF front ends constitute the reconstructed PSA. The experiment results validate that even utilizing a handful of antennas and RF front ends, it is still possible to yield high SINR by PSA reconfiguration. And the proposed reconfiguration approaches are quite effective in improving efficiency as well as achieving superior interference suppression performance.











Yandong Sun received the B.Sc. degree in communication engineering from Northwestern Polytechnical University, China, in 2017, where he is currently working toward the Ph.D. degree in information and communication engineering. His current research interests include array signal processing, optimization, and interference suppression.

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