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Hardware Implementation and Real-time Experimental Validation of a Direction of Arrival Estimation Algorithm

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Abstract : This research paper introduces an approach for estimating the direction of arrival (DOA) of multiple RF noncoherent sources in a uniform linear array (ULA). The proposed method utilizes a Capon-like estimation algorithm and incorporates LU decomposition to enhance the accuracy of DOA estimation while significantly reducing computational complexity compared to existing methods like the Capon method. Notably, the proposed method does not require prior knowledge of the number of sources. To validate its effectiveness, the proposed method undergoes validation through both software simulations and practical experimentation on a prototype testbed constructed using a software-defined radio (SDR) platform and GNU Radio software. The results obtained from MATLAB simulations and real-time experiments provide compelling evidence of the proposed method's efficacy.

Keywords : DOA estimation, real-time validation, software defined radio, computational complexity, Capon's method, GNU radio
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