

Comparison of Conformal Array and Uniform Rectangular Array with 2-D MUSIC Algorithm for Estimation of Direction of Arrival

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Abstract: The RADAR system needs to figure out the direction of arrival (DoA) of objects, especially when they are very close to each other. This is a challenging task for any ranging and detection system. Array antenna technology, which uses multiple antennas, has advanced to the point where they can achieve high angular resolution. The proposed approach improves the accuracy of DoA estimation by keeping higher number of sensors with smaller inter-sensor spacing and higher SNR. This paper investigates how conformal arrays can be better for high-speed aircraft radar systems to achieve improved angular resolution. To achieve higher resolution in DoA estimation, a subspace-based algorithm called Multiple Signal Classification (MUSIC) is used with conformal arrays. The paper focuses on comparing conformal arrays and Uniform Rectangular arrays (URA) for DoA estimation. The results show that conformal array receivers can resolve two closely spaced objects with 25 % improvement in azimuth angle and 68 % improvement in elevation angle compared to URA receivers. As the number of array elements increases in conformal arrays, more accuracy in DoA estimation with reduced grating lobes can be achieved. This is particularly useful in applications such as radar, communication, and medical imaging, where accurate DOA estimation is critical for optimal system performance.

Keywords: Conformal array, Rectangular array, DoA estimation, 2-D MUSIC algorithm

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