The Mutual Coupling Effect on the MUSIC Algorithm for Direction of Arrival Estimation

Abstract

The smart antenna systems combine antenna arrays with digital signal processing (DSP) algorithms. In a smart antenna system a specialized signal processor computes the direction of arrival (DOA) of a user and also adds the strength of the signals from each antenna element together to form a beam towards the direction as computed by DOA. If additional users join in
the system, the adaptive antenna processor can tune out unwanted interferers by placing nulls towards the signals not of interest, and concentrate on the desired user by the main beam toward the signal of interest. Smart antenna systems integrate with radio intelligence with antenna array technology to increase the channel capacity, coverage range and improve link quality. In adaptive array smart antenna, to locate the desired signal, various DOA estimation algorithms are used. This paper investigates the effect of mutual coupling on the Multiple Signal Classification (MUSIC) algorithm for DOA estimation and compares its performance with Bartlett algorithm. The half wavelength dipole antenna elements are used in the linear array antenna to carry out a performance study of the MUSIC and Bartlett algorithms by investigating the effect of the mutual coupling between the array elements. However simulation results in this paper show that MUSIC algorithm is highly accurate and stable and provides high angular resolution compared to Bartlett and hence applying the MUSIC algorithm is preferred in mobile communication to estimate the DOA of the arriving signals.

References


Index Terms

Computer Science
Signal Processing
Keywords

- Smart Antenna
- DOA
- MUSIC
- Bartlett
- Mutual Coupling