A Study on Beam Pattern Generation Method for Antenna Array System

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ABSTRACT

As more and more subscribers utilize wireless for communication and the vast amount of data, the loading is growing dramatically in today's cellular network. Hence, the most significant concern for network manager is system "Capacity". In this research, several factors that adversely affect system capacity in typical CDMA cellular network are extensively analyzed, including: (1). Unbalanced traffic load (2). Handoff overhead (3). Pilots interference. Unfortunately, the conventional sectorized cellular structure cannot resolve the above problems. In what follows, we provide a systematic study on several beam pattern generation algorithms in this research. In the first algorithm, the weights are derived to best approximate a desired array pattern either in a minimum-mean-square-error (MMSE) sense or by the consideration of several specific constraints. We have described several disadvantages of the first algorithm. In order to avoid these disadvantages, we develop the Spatial Sampling Method that exploit the discrete Fourier transform (DFT) technique and the Windowing Method that based on the digital FIR filter design technique. Simulation results demonstrate that the generated beam pattern can be flexibly shaped, steered, and gain-controlled for practical requirements in each method. We demonstrate that shaping, steering, and gain-control for each beam can efficiently resolve the above-mentioned three problems.

Keywords: System capacity, Unbalanced traffic load, Handoff overhead, Pilots interference, Minimum-mean-square-error, Discrete Fourier transform (DFT), FIR filter.


