

Smart Antenna Algorithms - Past, Present and Future  
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Space is truly one of the ``final frontiers'' when it comes to next generation wireless communication systems. Large-scale penetration of such such systems into our daily lives will require the significant reductions in cost and increases in capacity that only the spatial dimension can hope to offer. That this is certainly the case is attested to by the significant number of companies that have been recently formed to bring products based on such concepts to the wireless marketplace. The approaches range from "switched-beam" to "fully-adaptive" with the benefits provided by the various approaches differing accordingly.

Exploitation of the spatial dimension in some form or another has been going on since wireless communications came into being. The basic concept cellular systems rely on is that RF only "goes so far", a concept that has been taken full advantage of in broadcast TV and radio since their inception. This is clearly the simplest form of more efficient use (or reuse if you will) of the spatial dimension. As the center frequency of such systems increased along with the desire for mobility, the complexity of the RF environment increased as well, necessitating further developments to overcome the challenges. Extending a bit further into the spatial processing domain, antenna diversity concepts were realized, and the ideas of multidimensional signal processing started to permeate wireless communication systems.

As with many other areas of technological advancement, the pace accelerates once a new door is opened. In something of a convergence of digital signal processing power and algorithm development, fully adaptive multidimensional signal processing has now made its way into wireless communication systems and is providing substantial benefits. It is sometimes referred to as Spatial Division Multiple Access (SDMA) technology, a technology with roots in various defense-related development programs, which ArrayComm is currently productizing in its IntelliCell(tm) line of products. SDMA technology employs antenna arrays and multi-dimensional nonlinear signal processing techniques to provide significant increases in capacity and quality of many wireless communication systems. It is especially well-suited to the current and next generation cellular systems termed Personal Communications Service (PCS). Antenna arrays coupled with adaptive signal processing techniques employed at base stations improve coverage, capacity and trunking efficiency allowing lower cost deployments with cells of moderate to large size.

This talk will be an overview of past and present algorithms employed in smart antenna systems, and a look at what the future might bring in this area. A general discussion of the efficacy of the various approaches to different applications will be presented. Results from field trials demonstrating the efficacy of these systems will be presented along with a video demonstration time permitting.