

# Abstract

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## **Smart UWB System Based on STC and TR Techniques for BER Performance Enhancement and Interference Rejection**

In this research, a novel smart UWB system is introduced. The proposed system is based on using an adaptive maximum ratio combining (MRC) Rake receiver. The proposed adaptive Rake receiver uses Genetic algorithm (GA) to adaptively the delays of the fingers of the Rake receiver depending on the channel impulse response. It adaptively s the delays that will allow the Rake receiver to capture most of the energy in the multipath components with minimum complexity. This adaptive Rake receiver is referred to as a GA Rake. The adaptive GA Rake is applied to a single-input single-output and space time coding (STC) multi-input single-output UWB systems. The performance of those systems using a GA Rake is compared to their performance when using a conventional MRC-Rake receiver and showed a great enhancement in performance with less receiver complexity. Also, in this paper, the smart UWB system using STC is modified by using the time reversal (TR) pre-coding technique. The modified system is referred to as a TR smart UWB system. This modification leads to more enhancements in performance and more reduction in receiver complexity over the smart UWB system. Moreover, this paper also shows the ability a TR smart UWB system in combating interference from other UWB systems.