Differential decorrelator: a new approach for designing CDMA linear detector

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Abstract: The systems that are designed based on CDMA are suffering from a multiple access interference problem. The decorrelator CDMA detector is a linear detector that can cancel the MAI but with channel noise enhancement. The complexity of the decorrelator is a linear function in the number of the system's users. In this research, a new detector is proposed that can cancel the MAI in the received CDMA signal with a complexity that is independent on the number of the system's users. The new detector does not need to know the users' signature codes. Also, it consists of two matched filter only. No correlation matrix is required. This simple structure reduces the complexity of the proposed CDMA detector if it is compared with the conventional decorrelator detector.

The new detector is based on some mathematical operations on the output signals from two different matched filters. The detector idea is based on the symmetry property of the signatures' codes correlation matrix however; it does not need to know this matrix. The algorithm is valid as long as the correlation matrix is symmetry. It can work with synchronous and asynchronous system models.