A Multiuser Detector for Downlink DS/CDMA Communication System to solve Multipath Signal

蔡尚君、武維疆

E-mail: 9223674@mail.dyu.edu.tw

ABSTRACT

This thesis aims to provide multiuser detector structures that solve multipath fading for Downlink DS/CDMA communication system. In practical wireless environment, multipath fading leads to signature waveform distortion. The performance of the decorrelating detector is severely degraded. Moreover, the near-far resistant characteristic of the decorrelating detector is destroyed due to signature waveform perturbation. In what follows, we propose a total least-squares (TLS) algorithm and Multidimensional Multiple Signal Classification (MD-MUSIC) estimation method based LMD. Simulations are conducted under several situations, and the result demonstrate the proposed TLS and MD-MUSIC based detector is robust to fading-induced signature waveform distortion. In the proposed structure, array of antennas are applied in the basestation, thus downlink channel can be regarded as a multi-input single-output (MISO) system. Spatial processing is realized by a basestation downlink beamformer while temporal processing is performed in each desired mobile. We derive the time-varying beamforming weights to completely suppress multiple access interference (MAI). To fully utilize the path diversity, we exploit maximal ratio combining (MRC) technique in the mobile receiver. Both analytical and numerical evaluations are conducted in this thesis and the results demonstrate that system performance is comprehensively improved.

Keywords : Multipath ; Space-time processing ; MAI ; TLS ; MD-MUSIC ; LMD ; Array antenna ; MRC

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