Public Abstract

Sang-Yick Leong

CHANNEL MODELING, ESTIMATION AND EQUALIZATION
IN WIRELESS COMMUNICATION

Advisor: Dr. Chengshan Xiao

advisor's signature

Graduation Term: Winter 2005

Channel modeling, estimation and equalization are discussed throughout this dissertation. MLSE is an optimum equalizer for all the case. However, due to its computational complexity, it is impractical for today technologies in third generation wireless communication. Thus, a suboptimum equalizer so-called perturbation equalizer is proposed, which outperforms the RSSE equalizer in the sense of bit error rate or computational complexity. In order to improve the system performance dramatically, the iterative equalization algorithm is implemented. To avoid the exhausted computational complexity when using optimum receiver, an improved DFE algorithm, which only requires low computational complexity, is proposed for turbo equalization. The promising simulation results indicate that the proposed equalizer provides significant improvement in bit error rate while compared to the conventional DFE algorithm. Prior to channel equalization, channel estimation enable us to extract the necessary channel information from the pilot symbols for equalizers. Least-squares algorithm is a promising estimation algorithm providing the channel is time-invariant in a given period. Based on the derivations, we show that the channel is no longer constant and a new least-squares based algorithm is proposed to estimate the channel accurately. Besides, antenna diversity is alternate technique to improve the system performance. A new three dimensional multiple-input multiple-output abstract model is proposed for the investigation and understanding of the correlation of fading channel. The new model allows us to consider the channel correlation of which the mobile stations receive the incoming waves from any directions and angle spreads, and the closed form and mathematical tractable formula is derived for space-time correlation function.