OFDM Channel Estimation using Wiener Filtering and its Implementation

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ABSTRACT

Today’s wireless communication system Channel estimation and equalization is an essential part. Two main challenges exist in wireless channels which are multipath fading and doppler spread. Multipath fading represents the selectivity of the channel and as the delay spread of the channel increases, the frequency selectivity increases, and the channel changes rapidly between adjacent subcarriers. As the mobility of the user increases, the doppler shift increases, and the channel is less correlated in time. These effects are usually limiting the wireless systems and cause very high bit error rates if not estimated and equalized correctly. In this thesis, different channel estimation techniques for OFDM systems are examined. OFDM systems are dominating in wireless transmission. Simulations are made for many widely used channel estimation techniques and they are all compared with respect to their bit error rates and mean square errors. These methods are tested in different channel conditions to cover most of the states for wireless systems. From all of the compared techniques, the best algorithms are tested in WiMAX 802.16e as a real wireless system. A novel estimation technique is proposed for the WiMAX case. This technique is simple, and gives good performance compared to other techniques. This technique is based on Wiener Filtering and simple linear interpolations.