Frequency Domain Channel Equalization Using Circulant Channel Matrix Diagonalization

Channel impairments and additive noise tend to introduce distortion in the transmitted data, so that it cannot be perfectly recovered at the receiver. Several channel equalization techniques are used to undo the channel effect, and are classified into time domain equalization and frequency domain equalization. This paper focuses on the frequency domain equalization, employing the diagonalization of the circulant channel matrix. Applying the cyclic prefix before transmission, channel matrix becomes a circulant matrix, whose eigenvector decomposition leads to the diagonalization of channel matrix. The synthesis and analysis filter banks can be found from this approach and channel can be equalized by using inverse of the diagonal matrix coefficients. Simulation results validate the eigenvector approach for channel dependent equalization.