

ABSTRACT

Carrier Frequency Offset (CFO) occurs due to asynchrony between transmitter and receiver local oscillator, and/or due to Doppler Effect that is caused by high mobility. Due to CFO, the orthogonality between subcarriers can be disrupted. In the uplink system, different carrier frequency offsets of different users at the receiver resulting multiuser interference (MUI), thus degrade the performance of MC-CDMA system. In the previous study, Modified Minimum Mean Square Error Frequency Domain Equalization (Modified MMSE FDE) has been proposed by Agnihotri which results in a better performance than the conventional MMSE. However, the achieved Bit Error Rate (BER) is not smaller than 10^{-2} for Signal to Noise Ratio (SNR) below 20.

This research design a new algorithm in Multi-carrier Code Division Multiple Access (MC-CDMA) receiver side to mitigate MUI, that is called Enhanced MMSE FDE. Enhanced MMSE FDE is a modification of Modified MMSE-FDE to improve the system performance. Enhanced MMSE FDE takes into account the rest of MUI as well as Modified MMSE FDE to design FDE coefficient, but Enhanced MMSE FDE use CFO estimation that is not on Modified MMSE FDE. The value of CFO is estimated and regenerated in the receiver and then used to estimate MUI. MUI is assumed to be reconstructed and eliminated from the received signal. In order to get signal processing more efficient, Enhanced MMSE FDE takes only the real trace of FDE matrix.

The simulation result shows that MC-CDMA with Enhanced MMSE FDE using Binary Phase Shift Keying (BPSK) and 64 subcarriers with 4 users gives better performance than MC-CDMA with Conventional MMSE and Modified MMSE FDE that have been performed by Agnihotri. However, the complexity of Enhanced MMSE FDE that takes the whole of FDE coefficient matrix is higher than Modified MMSE FDE. By taking only the real trace of FDE coefficient matrix, complexity of Enhanced MMSE FDE is getting simpler than taking the whole of FDE coefficient matrix. Furthermore, Enhanced MMSE FDE that takes only the real trace of FDE coefficient matrix is 2.93 % more efficient than Enhanced MMSE FDE that takes the whole of FDE coefficient matrix.

Keyword— multiuser interference, Enhanced MMSE FDE, MC-CDMA.