Precoding-Assisted Frequency Division Multiple Access Transmission Scheme: A Cyclic Prefixes- Available Modulation-Based Filter Bank Multi-Carrier Technique

Authors : Ying Wang, Jianhong Xiang, Yu Zhong

Abstract : The offset Quadrature Amplitude Modulation-based Filter Bank Multi-Carrier (FBMC) system provides superior spectral properties over Orthogonal Frequency Division Multiplexing. However, seriously affected by imaginary interference, its performances are hampered in many areas. In this paper, we propose a Precoding-Assisted Frequency Division Multiple Access (PA-FDMA) modulation scheme. By spreading FBMC symbols into the frequency domain and transmitting them with a precoding matrix, the impact of imaginary interference can be eliminated. Specifically, we first generate the coding pre-solution matrix with a nonuniform Fast Fourier Transform and pick the best columns by introducing auxiliary factors. Secondly, according to the column indexes, we obtain the precoding matrix for one symbol and impose scaling factors to ensure that the power is approximately constant throughout the transmission time. Finally, we map the precoding matrix of one symbol to multiple symbols and transmit multiple data frames, thus achieving frequency-division multiple access. Additionally, observing the interference between adjacent frames, we mitigate them by adding frequency Cyclic Prefixes (CP) and evaluating them with a signal-to-interference ratio. Note that PA-FDMA can be considered a CP-available FBMC technique because the underlying strategy is FBMC. Simulation results show that the proposed scheme has better performance compared to Single Carrier Frequency Division Multiple Access (SC-FDMA), etc.

Keywords : PA-FDMA, SC-FDMA, FBMC, non-uniform fast fourier transform

Conference Title : ICICCP 2024 : International Conference on Intelligent Computer Communication and Processing

Conference Location : Istanbul, Türkiye

Conference Dates : April 25-26, 2024