Be Cautious when Using the FIR Channel Model with the OFDM-Based Communication Systems

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ABSTRACT

Orthogonal frequency-division multiplexing (OFDM) can be used to support high data rate transmissions over time-dispersive fading channels. Many OFDM-based communication systems use packet-based transmission, where channel estimation is needed for the detection of the information-carrying symbols. The finite impulse response (FIR) channel model is simple and effective for some simulations of the OFDM-based communication systems over the time-dispersive channels; yet, it is only an approximate channel model which cannot be used in the case of accurate channel estimation. Unfortunately, many researchers have overlooked this issue and have been devising channel estimation algorithms squarely based on the FIR channel model. While the channel estimation results from these algorithms can be impressive for the FIR channels, the algorithms can hardly be applied in real-world applications. This paper explains in detail the reason why the FIR channel model is only an approximate one for the OFDM-based communication systems, trying to discourage the inappropriate usage of this model, which can lead to fruitless efforts. This paper also presents a realistic channel model for the OFDM-based communication systems, which can be used to access the channel parameter estimation algorithms realistically.

INDEX TERMS

OFDM, channel model, channel estimation

IMPORTANT CONTRIBUTIONS

This paper explicitly indecates that the FIR channel model cannot accurately characterize the channels for the OFDM-based systems. Therefore caution is needed when using this model for the OFDM-based systems. It is especially not appropriate to design channel estimation algorithms for the OFDM-based system squarely based on this model; when this model is not appropriate, the modified exponential channel model can be used.

IMPOTANT CITATIONS

- [1] proposed an FIR (finite impulse response) filter channel model for the simulation of the time-dispersive fading channels for the OFDM-based communication systems.
- [2] used a non-FIR channel for channel estimation as the FIR channel model is not appropriate for channel estimation.

REFERENCES

[1] N. Chayat, "Tentative criteria for comparison of modulation methods," *Document: IEEE P802.11-97/96*, September 1997.

[2] J. Liu and J. Li, "Parameter estimation and error reduction for OFDM-based WLANs," *IEEE Transactions on Mobile Computing*, vol. 3, pp. 152–163, April–June 2004.