On Improvement of the ICI Canceller for OFDM Mobile DTV Receiver

Hai Minh TRAN*, Tomohisa WADA**

*Graduate School of Engineering and Science
**Department of Information Engineering, University of the Ryukyus
haitran@lsi.ie.ryukyu.ac.jp, wada@ie.ryukyu.ac.jp

Abstract—In mobile environment, the performance of OFDM mobile receiver is degraded severely because of Inter-Carrier-Interference (ICI) caused by Doppler Spread. Therefore, ICI canceller is an important task for the OFDM mobile receivers. [1] and [2] proposed an efficient method to reduce ICI. The main idea of this method is to linearly approximate time varying channel within one OFDM symbol. Then a big ICI matrix equation is given. However, in [1] and [2], the estimated values of the channel transfer function—the diagonal of the ICI matrix is corrupted by ICI. Consequently, the equalized signal still is distorted. In this paper, we proposed an iterative method to improve performance of the original method. We implemented Jacobi iteration method with low complexity to solve the big ICI matrix equation. Next, at second iteration of Jacobi method, we improve the diagonal by removing ICI from pilot symbols and re-estimating the channel transfer function. Simulation results for ISDB-T mode 3 demonstrated our method doubled performance of the original method under TU-6 channel and Doppler Spread. The improvement is better for two paths and one path Doppler channel.

Keyword—Inter-Carrier-Interference, Jacobi Iteration, Orthogonal Frequency-Division Multiplexing

Tran Minh Hai was born in Hanam, Vietnam, on June 09, 1988. He received the B.S. degree from Hanoi University of Technology, Vietnam in 2011. He is currently a Master student in Graduate School of Engineering and Science, University of the Ryukyus. His research interests are channel estimation with its application to digital television mobile receiver and LTE system.

Tomohisa Wada received the BS degree in electronic engineering from Osaka Univ., Osaka, Japan, in 1983, M.S.E.E degree from Stanford Univ., Stanford CA, in 1992, and Ph.D. in electronic engineering from Osaka Univ. in 1994. He joined the ULSI Laboratory Mitsubishi Electric Corp., Itami, Japan, in 1983. From 1983 to 1999, he has been engaged in the development of CMOS/BiCMOS static RAMs, 3-D graphics controller ASIC, flash memory, low-voltage static RAM, and synchronous burst static RAMs. In 1998, he joined Mitsubishi Electric Corp., Semiconductor Group, Memory ICI Division, Itami, where he has been working on the development of application specific synchronous burst static RAMs. In 1999, he became an Associate Professor with the Department of Information Engineering, Univ. of the Ryukyus, Okinawa, Japan. Since 2001, he has been a Professor at the Department of Information Engineering, Univ. Of the Ryukyus, Okinawa, Japan. In 2001, He was the founding member of Magna Design Net, Inc., which is a fab-less LSI design Company for communication related digital signal processing such as OFDM. Currently, he is also the chief scientist of Magna Design Net, Inc. From 1999 up to now, he has been engaged in the research and development of high bandwidth communication systems such as terrestrial video broadcasting receivers and wireless LAN. Currently, his research includes system-level large-scale VLSI design, digital signal processing for high-bandwidth communication, error correction algorithm and circuit, networking software and protocols.