



Electrical Engineering Colloquium
Dallas Chapter of IEEE Signal Processing Society Presents

Architectures for Symbol Timing Synchronization in Multiple-Input Multiple-Output (MIMO) Communications

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Maximum likelihood symbol timing estimation for communication over a frequency non-selective MIMO fading channel is developed. The cases of known data (data-aided estimation) and unknown data (non-data-aided estimation) are considered. The analysis shows that the log-likelihood functions and their approximations can be interpreted as the sum of SISO log-likelihood functions operating on each of the receive antennas. Previously published symbol timing estimators are shown to be special cases in the more general framework presented. Architectures based on both block processing and sequential processing using a discrete-time phase-locked loop are summarized. Performance examples over a MIMO channel based on measured data and on a simple stochastic MIMO channel model suggest that the means-squared error performance of these techniques is not strongly dependent on the MIMO channel and is able to reach the Cramer-Rao bound when sufficient complexity is applied.

Bio - Michael Rice received his PhD from Georgia Tech in 1991. He was with Digital Transmission Systems, Inc. in Atlanta and joined the faculty at Brigham Young University in 1991 where he is currently the Jim Abrams Professor in the Department of Electrical & Computer Engineering. Dr. Rice was a NASA/ASEE Summer Faculty Fellow at the Jet Propulsion Laboratory during 1994 and 1995 where he worked on land mobile satellite systems. During 1999-2000, he was a visiting scholar at the Communication Systems and Signal Processing Institute at San Diego State University. His research interests are in the areas of digital communication theory and error control coding with a special interest in applications to telemetry and software radio design. He has been a consultant to both government and industry on telemetry related issues. He was Chair of the Utah Section of IEEE from 1997 to 1999 and Chair of the Signal Processing & Communications Society Chapter of the Utah Section from 2002 to 2003.

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