

SESSION TB1

MULTI-USER INFORMATION THEORY II

CAPACITY OF FRAME-ASYNCHRONOUS MULTIPLE-ACCESS CHANNELS WITH MEMORY

SERGIO VERDÚ, Department of Electrical Engineering, Princeton University, Princeton, NJ 08544 USA.

This paper considers discrete two-user multiple-access channels with memory where the transmitters are not synchronized so that their codewords start simultaneously. Frame-asynchronous multiple-access channels with memory arise, for example, in the modeling of completely asynchronous channels where there is no synchronization at either the symbol or the codeword level. It is known that the absence of frame-synchronism in memoryless multiple-access channels results in the removal of the convex hull operation from the expression of the capacity region. In this paper, it is shown that when the channel has memory, frame-asynchronism rules out non-stationary inputs in order to achieve any point in the capacity region, thereby allowing only coding strategies that involve cooperation in the frequency domain, but not in the time domain. This restriction drastically reduces the capacity region of some multiple-access channels with memory, and in particular the maximum rate-sum (total capacity), which is invariant to frame-asynchronism for memoryless channels. This research was partially supported by the Office of Naval Research under contract N00014-87-K-0054.

MULTIPLE-ACCESS CHANNELS WITH RELAY

CHAO-MING ZENG, FEDERICO KUHLMANN and ANDRÉS BUZO, Universidad Nacional Autónoma de México, Facultad de Ingeniería, División de Estudios de Posgrado, P.O. Box 70-256, 04510 México, D.F.

A new multi-user channel model called multiple-access relay channel (MARC) $\{X_1 \times X_2 \times X_3, P^*(y, y_1 | x_1, x_2, x_3), T \times T_1\}$ is introduced to model a simultaneous transmission from two senders to a common receiver, with a relay channel which is intended to aid their transmissions. Achievable rate regions are found for both degraded discrete memoryless (DM) and degraded Gaussian MARC (i.e., the output at the common receiver is a degraded version of the relay output), using backward decoding combined with superposition block Markov encoding. We also give an outer bound to the capacity region for the general DM MARC. Finally, an inner bound and an outer bound for the capacity region of the DM MARC with feedback are established. These results show that the obtained inner and outer bounds are reasonably tight.