

Report on "The Capacity Region of a Class of Three-Receiver Broadcast Channels with Degraded Message Sets" by C. Nair and A. El Gamal.

This paper investigates the broadcasting problem in which a common message is to be delivered to all users, and private messages are to be delivered to different subsets of users.

Korner and Marton developed the capacity region for the two-receiver case in 1977. This paper investigates the three-receiver case, about which comparatively little had been known.

The main result of the paper is that the straightforward extension of the Korner-Martton coding scheme to the three-receiver case is not capacity achieving, as some had speculated. In particular, the authors construct a novel coding scheme with "indirect" decoding that does better than the extended Korner-Martton scheme. Moreover, the authors show that such a scheme is capacity-achieving in at least some special but nontrivial cases.

This is a fine paper. The novelty of the coding scheme in their achievability argument is noteworthy, as is establishing limitations of the Korner-Martton construction. At the same time, while the implications could ultimately be significant, the actual results are somewhat narrow in scope, and the demonstrated gains over the Korner-Martton region are quite small.

If we take the view that the paper award signals to the broader community what the IT society considers its most exciting work of the year, then this paper probably isn't the kind of example we would choose. At the same time, if we take the view that the paper award serves to recognize and foster a promising new direction within the IT society, then this paper is more effective in that regard, but still to a rather limited degree. That said, the work is thoughtful, careful, insightful, and very well written---all qualities we ought to encourage in the community.

As a final comment, it does seem quite unfortunate that given his record of seminal contributions, El Gamal has never been recognized with a paper award by the society. From that perspective, it would be nice to find an opportunity for recognition. I'm just not sure this is the right piece of work to recognize in this way. Somehow I think even he'd agree.