Progress Report

Cooperative Strategies and Capacity Theorems for Relay Networks

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1. **Current Status:**

   Currently, I have started understanding and analyzing the two main strategies used in relaying signals in relay networks. I will start with the decode-and-forward (DAF) strategy and then turn to the compress-and-forward (CAF) one.

2. **Accomplished Work:**

   A comprehensive study and analysis have been done for the following issues:

   - The previous work and research done on this type of networks.
   - Models and preliminaries:
     - Relay network model (like 2-relay and 3-relay networks).
     - Capacity upper bound.
     - Multiaccess relay channel (MARC) model.
     - Broadcast relay channel (BRC) model.

3. **Next to Do:**

   In next step, I will start studying and analyzing the two types of relaying: the DAF and the CAF in deep. In the DAF strategy, I will study the following topics: rates for one relay, regular encoding for one relay, multiple relays, MARCs, and finally, the BRCs model. In the second strategy which is the CAF, both the one relay and the multiple relays cases will be met.

   Since the paper is huge, covering the previous topics will take somewhat long time. If the time permits, we may talk about the mixed strategies, some wireless models including: optimization of the cut-set and the DAF rates, no fading and one relay, no fading and many relays, phase fading and many relays, phase fading and many relays, phase fading with many relays and multiple antennas, fading with directions, and finally, the quasi-static fading.
Some key references:


