Minisymposium 1 - Discrete Optimization

Minimizing Switching Networks

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Switching networks are directed acyclic graphs with specified disjoint sets of input and output nodes. A connection request is a partial function from the set of output nodes to the set of input nodes specifying which input node needs to be routed to which output nodes. A switching network is called rearrangeably nonblocking with respect to multicast traffic if all connection requests are routable, that is, if for each request there exists a set of mutually vertex-disjoint directed trees connecting each input node to its designated output nodes. Clos networks are switching networks, where nodes are set up in stages to reduce size and cost.
The problem of characterizing routability of multicast-rearrangeable Clos networks is still open. In this talk we bring some new insights into this problem. We formulate the problem as a vertex-coloring problem. We identify critical requests whose routability implies the routability of all others by applying some known theorems, by using reduction techniques and by exploiting symmetry. By efficiently enumerating all critical requests, we are able to characterize the routability of Clos networks with up to 32 input and output nodes.