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Sommario/riassunto	Long description: We consider the problem of decentralized controller and network design under communication constraints. Traditionally, this problem is solved in a two-step approach by first deciding on a topology and then designing the dynamical couplings. In this thesis, we present a new approach by solving the problem of topology design and dynamics within one joint optimization problem. Structure design is then done subject to classical performance constraints on the closed loop system. We develop computationally efficient formulations by means of convex relaxations. This makes the proposed design methods attractive for practical applications and allows a tradeoff between sparsity of the subsystem interactions and achievable performance. We further introduce the concept of an l0-system gain for discrete linear time invariant systems, inspired by classical system gains from robust control. With this newly introduced system gain, we give a system theoretic explanation of the sparse closed loop response of l1-optimally controlled systems.