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*Directed complete bipartite graph decompositions and three-state sensor networks*

We examine edge-decompositions of the complete $\lambda$-fold directed graph $\vec{K}_n$ into complete bipartite directed subgraphs $\vec{K}_{a,b}$ as a model for communication in sensor or mobile ad hoc networks. In such a network, each node can be in one of three states: asleep (powered down), listening, or transmitting. Communication is effective only when the sender is transmitting, the destination is listening, and no other node in proximity to the receiver is also transmitting. We associate the vertices of $\vec{K}_n$ with nodes of the network, and blocks of the graph decomposition with time slots for communication.

A block with out-vertices $A$ and in-vertices $B$ corresponds to a slot in which the nodes in $A$ are transmitting, those in $B$ are receiving, and all others are asleep. Thus, such a decomposition of $\lambda\vec{K}_n$ guarantees every ordered pair of nodes in the associated network can communicate in $\lambda$ time slots. However, it is also desirable to minimize interference by a third node. This talk will mention various constructions for these graph decompositions, with particular emphasis on properties minimizing interference.