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The Cerny Conjecture and Synchronizing Times for k-sets in Automata

An automaton consists of a finite set of states and a collection of functions from the set of states to itself. An automaton is *synchronizing* if there is a word (that is, a sequence of functions) that maps all states onto the same state. The Černý conjecture is a famous open problem on the length of the shortest such word. We consider the closely related question of determining the minimum length of a word mapping k states onto a single state.

For synchronizing automata, we have improved the upper bound on the minimum length of a word that sends some triple to a single state from $0.5n^2$ to $\approx 0.19n^2$. I will discuss this result and some related results, including a generalization of this approach this to an improved bound on the length of a synchronizing word for 4 states and 5 states.

This is joint work with Robert Johnson.