

On the Minimal Reset Words of Synchronizing Automata

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Cerny's conjecture is a 50-year old question which concerns the combinatorial field of synchronizing automata. In particular, it postulates that the maximal length of the minimal reset word among all n -state automata is $(n-1)^2$. A proof is presented for Pin's Theorem, which applies Cerny's conjecture to p -state automata consisting of a cycle and a non-permutation, where p is an odd prime. Also, families of automata of the form $F(p, k)$ are introduced; they consist of a cycle and a group of k disjoint merging arcs. $C(p, k)$ is defined to be the maximal length of minimal reset words within these families. A lower bound of $C(p, k)$ for general k is demonstrated, and the exact value of $C(p, 2)$ is found. These results are presented in two original theorems. In order to prove these statements, a connection is discovered between the structures of automata within $F(p, k)$ and the cyclotomic field with respect to p .