The words separation problem, originally formulated by Goralcik and Koubek (1986), is stated as follows. Let Sep(n) be the minimum number such that for any two words of length <= n there is a deterministic finite automaton with Sep(n) states, accepting exactly one of them. The problem is to find the asymptotics of the function Sep. This problem is inverse to finding the asymptotics of the length of the shortest identity in full transformation semigroups Tk. The known lower bound on Sep stems from the unary identity in Tk.

By

С помощью различных переборов, экспериментов и наблюдений над известными к тому моменту тождествами мне удалось найти новые тождества в Тк и Ск для маленьких к. Эти тождества помогли

We find the first series of identities in Tk which are shorter than the corresponding unary identity for infinitely many values of k, and thus slightly improve the lower bound on Sep(n). Then we present some short positive identities in symmetric groups, improving the lower bound on separating words by permutational automata by a multiplicative constant. Finally, we present the results of computer search for short identities for small k.