

The graph structure of a deterministic automaton chosen at random

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An n -state deterministic finite automaton over a k -letter alphabet can be seen as a digraph with n vertices which all have k labeled out-arcs. Grusho [1] proved that whp in a random k -out digraph there is a strongly connected component of linear size, i.e., a giant, and derived a central limit theorem. We show that whp the part outside the giant contains at most a few short cycles and mostly consists of tree-like structures, and present a new proof of Grusho's theorem. Among other things, we pinpoint the phase transition for strong connectivity.

Keywords: random digraphs; deterministic finite automaton

References

- [1] A. A. Grusho. Limit distributions of certain characteristics of random automaton graphs. *Mathematical Notes of the Academy of Sciences of the USSR*, 14(1):633–637, 1973.