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3-PARTY MESSAGE COMPLEXITY IS BETTER THAN 2-PARTY ONES FOR PROVING LOWER BOUNDS ON THE SIZE OF MINIMAL NONDETERMINISTIC FINITE AUTOMATA [1]

HENRY N. ADORNA [2]
Department of Mathematics, University of the Philippines
Diliman 1101 Q.C., Philippines
e-mail: henri@math.upd.edu.ph

ABSTRACT

Despite the facts that automata theory is one of the oldest and most extensively investigated areas of theoretical computer science, and finite automaton is the simplest model of computation, there are still principal open problems about finite automata. One of them is to estimate, for a regular language L, the size of the minimal nondeterministic finite automaton accepting L. Currently, we do not have any method that would at least assure an approximation of this value, however, a lower bound could be obtained by noticing that the sizes of the minimal deterministic finite automaton and a minimal nondeterministic finite automaton can only be exponentially apart from each other. The best known technique for proving lower bound on the size of the minimal nondeterministic finite automata is based on communication and this technique covers all previously used approaches. Unfortunately, there exist regular languages with an exponential gap between the communication complexity lower bound and the size of a minimal nondeterministic finite automaton. The contribution of this paper is to improve the communication complexity lower bound technique in order to get essentially better lower bounds for some regular languages.

Keywords: Finite automata, communication complexity, uniform protocol, lower bound

1. Introduction

Automata theory is one of the oldest and most extensively investigated area of theoretical computer science and finite automaton is the simplest model of computation. Old as it is, there are still principal open problems about it, e. g., for a regular language L, we would like to estimate the size of the minimal nondeterministic finite automaton (NFA) accepting L. At the moment, we do not have any method that would at least assure an approximation of this value. This is in contrary to the

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