

REMARKS ON MULTIPLE ENTRY DETERMINISTIC FINITE AUTOMATA ¹

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ABSTRACT

We investigate several aspects of the multiple entry DFA's. We consider their DFA conversion. Further, we show that they appear as minimal NFA's for certain classes of languages. Finally, we deal with their decompositions into disjoint unions of automata with fewer states.

Keywords: Multiple entry DFA, minimalization, conversion, decomposition

1. Introduction

Multiple entry deterministic finite automata are non-deterministic finite automata with a very restrictive and natural kind of non-determinism. They have been studied in numerous papers: see the recent ones by Holzer, Salomaa and Yu [4] and by Malcher [9] and the references there.

After this introductory section, Section 2 contains preliminaries and recalls that the minimalization of a DFA is a “local” task (i. e., one considers certain quotient of a given automaton) and that the problem of the minimalization of an k -entry deterministic finite automaton within the class of all such automata is NP-complete [9]. In Section 3 we complete the results from [4] concerning the DFA conversion. In Section 4 we point out that for regular languages with a group as the syntactic monoid one can find minimal NFA's in our class. In the next section we show that the same is true for an other class of languages. Finally, in Sections 6 and 7 we consider the so-called decompositions of our automata. This leads to a new notion of minimality : in this sense a disjoint union of several automata with $< n$ states is more simple than an n state automaton. This can be justified from the viewpoint of the so-called distributed computing. The proposed decompositions is again of a “local” character since the resulting components are quotients of the automaton under consideration.

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