ON TESTING OUTPUT FAULTS
IN THE MCCLUSKEY FAULT MODEL

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ABSTRACT

McCluskey et al. introduced a very general fault model for finite automata. In this paper we will show that all testable output faults can be tested by a single input word in this model. Furthermore, in the case of irreducible automata we will show that this is true for all output faults. Our main tool to prove the results is a careful analysis of the structure of automata especially considering subautomata and edge-(state)traverses of the transition graph induced by input words.

Keywords: finite automata, faults, testability, subautomata, irreducible automata, traverses

0. Introduction

In [1], [4] and following papers McCluskey et al. developed a very general fault model for finite automata. A fault of an automaton *A* is any different automaton with the same inputs, outputs and states. They considered various classes of faults and gave algorithms for calculating test sets, i. e., sets of input words so that the resulting outputs indicate whether a fault is present or not. Testing a fault can be done assuming that the automaton always starts with the same state (testability) or in (possibly) different states (strong testability). The latter one is closely related to the structure of the given automaton. This is also true for output faults – faults which affect only the output-unit. An output fault has the same transitions as the given automaton. We can show that for a given automaton the class of all its strongly testable output faults can be tested by a single word. Fault diagnosis is connected to experiments on automata first studied by Moore [3]. Though faults are not mentioned one can find a few remarks in [2] touching on this connection. Moreover, McCluskey et al. put some emphasis on reset mechanisms, though they are not part of the automaton and operate faultfree. In connection with traverses of edges respectively states we will make heavy use of resets. But we do not assume that they are an additional faultfree part of the automaton under consideration.