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ON THE EXISTENCE OF FINITE ISOMORPHICALLY COMPLETE SYSTEMS OF AUTOMATA [1]

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ABSTRACT

In the theory of compositions of finite automata it is a central problem to study systems from which every automaton can be built under a given composition and representation. Such systems are called complete with respect to the considered composition and representation. From practical and theoretical points of view, those compositions and representations have great importance for which there are finite complete systems. Under the isomorphic embedding as representation, a graph theoretical necessary condition of the existence of finite complete systems is presented in [3]. In this paper, we give a sufficient condition for a composition to admit a finite complete system under the isomorphic representation, which reduces the question to a graph coloring problem.

Keywords: automata, compositions, completeness.

1. Introduction

The notion of complete system was introduced by V. M. GLUSHKOV in [4] where he introduced the general product and characterized the complete systems for this product under the isomorphic embedding as representation.

One can consider compositions as networks of automata. In this case, the underlying graphs are the complete graphs, and each vertex contains an automaton. If the network receives an external input sign, then simultaneously, each component automaton receives an input sign which may depend on the external input sign and all of the actual states of the ancestor automata of the considered one. On the basis of this network approach, we can define different compositions by giving the set of the available underlying graphs. Having this general definition of composition it is natural to look for conditions on the underlying graphs under which there are finite isomorphically complete systems with respect to the corresponding product. This question is studied in [3] where it is proved that if there exists a finite complete system for some composition under isomorphic embedding as representation, then for every integer

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